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TUMOURS OF THE OVARY

&c.

CLINICAL AND PATHOLOGICAL OBSERVATIONS
ON
TUMOURS OF THE OVARY, FALLOPIAN
TUBE, AND BROAD LIGAMENT

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BY

ALBAN H. G. DORAN, F.R.C.S.

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WITH THIRTY-TWO ILLUSTRATIONS BY THE AUTHOR AND G. J. BERJEAU



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LJS.

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PREFACE.

SINCE I first joined the staff of the Samaritan Free Hospital in the spring of 1877, I have assisted at nearly seven hundred abdominal sections. In November 1877, I determined thenceforth to take brief notes of every case that came under my notice, either at that institution or elsewhere. In this manner I have succeeded in collecting a considerable amount of material, upon which this work is founded. I have avoided certain subjects that have repeatedly been discussed by surgeons who have had frequent opportunities of performing ovariectomy, such as statistics of mortality, the merits of the antiseptic system, the use of the drainage tube, the weight of tumours, and the nature of their fluid contents. On the other hand, I have dwelt at some length upon other pathological and clinical questions in relation to tumours of the uterine appendages. In this way I have endeavoured to utilise the resources of the Samaritan Hospital after the manner of Dr. Henry Savage and the late Dr. C. H. Ritchie; the 'Surgery of the Female Pelvic Organs' of the former being based to a great extent upon researches made at that hospital, whilst Dr. Ritchie's 'Ovarian

Physiology and Pathology' was the result of the examination of a large series of ovarian tumours removed by Sir Spencer Wells at the same institution.

In the chapter on the origin of multilocular ovarian cysts, I have described the result of repeated examinations of human foetal, infantile, and adult ovaries prepared for me after different methods by different experts, and have given my reasons for believing that these tumours most probably arise from Graafian follicles that have never developed into corpora lutea. Under natural conditions such follicles undergo atrophy, but under certain morbid influences they develop into cysts. This point cannot be thoroughly settled till the verification or refutation of Dr. Foulis' theory that the cells lining the follicles arise from the stroma, and not from the germinal epithelium together with the ova. If this theory be perfectly correct, a purely stromal origin for cysts becomes possible. If the stroma normally produces cells to line cavities protecting ova, it is easy to understand that it may, under pathological influences, produce such cells where there are no ova. Under Balfour's theory, that the follicular cells arise with the ova from the germinal epithelium, each collection of such cells in the stroma must be considered to be a follicle, and any morbid growth from such cells would be of essentially follicular origin.

The relation of ovarian cysts to the broad ligament, and the true origin and nature of cysts that are found within the layers of that peritoneal fold, are subjects that have particularly interested me, as I have enjoyed favourable opportunities of studying morbid conditions of the broad ligament, when engaged

in the examination of several hundred cysts and uterine appendages immediately after operation. I prepared a large number of specimens illustrating the morbid anatomy of the broad ligament, for the Museum of the Royal College of Surgeons of England, a few years since, and some of my views on the subject are published in the archives of metropolitan societies. They will be found, in a collective form, in the third and fourth chapters of this work. I have devoted further chapters to the consideration of other subjects associated with disease of the ovaries and broad ligament. The arrangement of these subjects being, for various reasons, somewhat different from that which is familiar to the reader of ovarian literature, I have added an index to facilitate reference. In describing specimens which I have prepared for the Museum of the College of Surgeons, I have added the number of each specimen as given in the new edition of the Catalogue of the Pathological Series. As the volume of the new Catalogue which includes the series of specimens illustrating diseases of the uterine appendages is not yet published, it is possible that some of the numbers may be altered when that volume appears in print, but, on reference to the series in question, there will be little difficulty in identifying the specimens.

I have avoided synonyms, in which ovarian literature abounds, as much as possible, and endeavoured to adhere to a nomenclature that is in conformity with general pathology. I have used the terms 'papilloma' and 'papillary tumour' indiscriminately for morbid growths the essential feature of which is that they consist of papillary masses, but have avoided the

former term 'papilloma,' in reference to glandular or adenomatous tumours that bear papillary growths on their surfaces, as I have explained at p. 31. As to the term 'glandular growth,' it has so long been employed by writers on ovarian disease, that I have generally made use of it in preference to the more modern expression 'adenoma.'

The illustrations are entirely original. Nine, namely figs. 13, 14, 15, 16, 17, 19, 26, 27, and 29, were drawn by Mr. C. J. Berjeau; the remainder were sketched by myself, mostly from recent specimens. The engraving has been executed by Mr. Danielsson (Lebon and Co.). In fig. 2, 3, p. 10, the appearance of the epithelium is somewhat unnatural, owing to the free border having been inadvertently shaded.

I have specially mentioned in the different chapters of this work the names of those colleagues and friends to whom I have been indebted for aid in my pathological researches, and I here take the opportunity of thanking them collectively for their kind assistance.

51 SEYMOUR STREET, LONDON, W.:

July 1884.

CONTENTS.

CHAPTER	PAGE
I. THE ORIGIN OF THE COMMON MULTILOCULAR OVARIAN CYST	1
II. MULTILOCULAR AND GLANDULAR OVARIAN CYSTS . . .	14
III. THE PAROVARIUM AND ITS RELATION TO CYSTIC DISEASE OF THE BROAD LIGAMENT—SIMPLE BROAD LIGAMENT CYSTS	40
IV. PAPILLOMATOUS AND SESSILE OVARIAN CYSTS—PAPILLO- MATOUS DISEASE OF THE BROAD LIGAMENT . . .	59
V. DERMOID CYSTS OF THE OVARY	77
VI. SOLID TUMOURS OF THE OVARY	93
VII. RUPTURE OF OVARIAN CYSTS	105
VIII. TWISTING OF THE PEDICLE	118
IX. THE ABDOMINAL WOUND—NOTES ON ADHESIONS . . .	126
X. COMPLETE INTRA-PERITONEAL LIGATURE OF THE PEDICLE	137
XI. MORBID CONDITIONS OF THE KIDNEY ASSOCIATED WITH OVARIAN TUMOURS	152
XII. TUMOURS OF THE FALLOPIAN TUBE	165
LIST OF AUTHORS QUOTED IN THIS WORK	177
INDEX	181

ILLUSTRATIONS.



FIG.	PAGE
1. SECTION OF THE OVARY OF A SEVEN-MONTHS' FETUS	4
2. CHANGES IN ATROPHYING FOLLICLES	10
3, 4. GLANDULAR OR ADENOMATOUS GROWTH FROM THE INTERIOR OF A MULTILOCULAR CYST	32, 33
5. DIAGRAM OF THE STRUCTURES IN AND ADJACENT TO THE BROAD LIGAMENT	42
6. PAROVARIIUM, SHOWING CYSTS DEVELOPED FROM ITS TUBES, AND GARTNER'S DUCT	43
7. HYDATIDS OF MORGAGNI ABOVE AND BELOW THE NORMAL DEGREE OF DEVELOPMENT	45
8. PEDUNCULATED BROAD LIGAMENT CYSTS	46
9. SESSILE BROAD LIGAMENT CYST OF PAROVARIAN ORIGIN	47
10. DISSECTION OF A BROAD LIGAMENT CYST DEVELOPED INDEPEN- DENT OF THE PAROVARIIUM	47
11. BROAD LIGAMENT CYST DEVELOPED ABOVE THE FALLOPIAN TUBE	48
12. BROAD LIGAMENT CYST DEVELOPED IN THE PROXIMITY OF THE OVARIAN FIMBRIA OF THE TUBE	53
13. A SIMPLE BROAD LIGAMENT CYST	54
14. A SMALL MULTILOCULAR OVARIAN CYST	60
15. INCIPIENT CYST OF THE HILUM OF THE OVARY	61
16. A LARGE CYST OF THE HILUM OF THE OVARY	62
17. DERMOID CYST OF THE OVARY	87
18. ROUND-CELLED SARCOMA FROM A DERMOID CYST	90

FIG.	PAGE
19. MYOMA OF THE OVARY	97
20. SPINDLE-CELLED SARCOMA OF THE OVARY	99
21. ROUND-CELLED SARCOMA DEVELOPING IN AN OVARY	99
22. ALVEOLAR SARCOMA OF THE OVARY	101
23. TUMOUR OF THE OVARY OF UNCERTAIN NATURE	102
24. THE SAME TUMOUR, MORE HIGHLY MAGNIFIED	102
25. CANCER OF THE OVARY	103
26. SECONDARY CYST UNDERGOING EFFACEMENT	116
27. DERMOID CYST TWISTED OFF ITS PEDICLE	123
28. PEDICLE OF THE SAME CYST	123
29. CYST, TWISTED OFF ITS PEDICLE, RECEIVING VASCULAR SUPPLY FROM ADHESIONS	124
30. DILATED VEIN FROM A TWISTED PEDICLE	125
31. CYST AND ADJACENT PARTS AFTER LONG DRAINAGE	131
32. STUMP OF AN OVARIAN PEDICLE: DEATH FROM TETANUS ON THE EIGHTH DAY AFTER OPERATION	141

TUMOURS

OF THE

OVARY, TUBE AND BROAD LIGAMENT.

CHAPTER I.

THE ORIGIN OF THE COMMON MULTILOCULAR OVARIAN CYST.

OF all questions connected with ovarian pathology the most unsatisfactory is the origin of the common multilocular ovarian cyst. Where there are many opinions there must also be much error, and careful and competent observers differ strongly from each other as to the development and normal condition of the tissues which are the seat of the most interesting form of disease affecting the ovary. Many seem to have based their chief theories on what are really terms given to appearances. I refer particularly to the so-called tubes of Pflüger, round which expression the arguments of De Sinéty and Malassez may be said to revolve. Others trace ovarian cystic disease to a colloid or mucoid change in the ovarian stroma, but are not agreed among themselves as to the precise nature of the primary change, some believing that it originates within the Graafian follicles at some stage of their development, others that it is entirely independent of these structures.

I have had the opportunity of examining a considerable number of foetal human ovaries, and also of comparing them with the ovaries of children under puberty. One result of my observations is that I cannot help agreeing with the conclusion of Balfour and Foulis, both of whom I know to have had far greater experience than myself in the study of the develop-

ment of the healthy ovary, that the tubes of Pflüger do not exist as such. A fertile source of error amongst microscopists is the idea that a section represents the natural condition of a structure. It is true that a cell is admitted to be not a flat plate, or a mere surface with a round or fusiform outline, and with, it may be, processes radiating from the outline alone, but a more or less spherical solid body, where processes, when they exist, radiate in all directions from the entire periphery. It is not so often remembered that what appear to be networks of filamentous processes, are in reality planes of delicate tissue, intersecting one another, so as not merely to enclose a space, but also to box up solid matter. A section, in such a case, shows what appear to be tubes cut across, but what are really collections of cells surrounded completely by stroma. In short, the microscopist must be ever on the alert lest he take appearances for facts.

I feel bound to declare that, whilst in no way claiming to discover what Balfour and Foulis have discovered, or advanced as a theory, I ever believed that the 'tubes,' as I saw them in foetal human ovaries, were simply rows of follicles imbedded in the ovarian stroma. Whether they had imbedded themselves, growing down from the germinal epithelium, or whether the stroma had grown up into the limits of that epithelium I never could decide; but I saw that the epithelium was in rows deeply imbedded in the stroma, and that the rows were not tubes.

Putting aside the main point where Balfour and Foulis differ—the former believing that the follicular epithelium is derived from the germinal epithelial cells, whilst Dr. Foulis contends that it is developed from the connective-tissue cells of the ovarian stroma—I will quote the opinions of these accurate observers on the Pflüger's tube theory.

Balfour considered that the parenchyma of the ovary was made up of thickened germinal epithelium, differing from the original germinal epithelial patch in that it is broken up into a kind of meshwork by ingrowths of the stroma. Hence Pflüger's tubes are merely trabeculae of germinal epithelium.

Dr. Foulis says: 'All the ova are derived from the germ-epithelial cells. In the development of the ovary, small and large

groups of the germ-epithelial cells become gradually imbedded in the ever-advancing stroma. Germ-epithelial cells do not grow downwards into the substance of the ovary. The ovarian stroma constantly grows outwards, surrounding and imbedding certain of the germ-epithelial cells. As these latter increase in size and as the stroma thickens around them, the whole ovary becomes enlarged. Pflüger's tubes in the kitten's ovary have no existence as such, but are appearances produced by long groups of germ-epithelial cells, many of which groups are not completely cut off from the germ-epithelial layer by the young ovarian stroma. Such groups of germ-epithelial cells, in various forms, are met with in all ovaries, but have no importance whatever as tubular structures. In the human child's ovary numerous furrows or clefts between irregularities of the surface are met with. Sections through these furrows and clefts produce the appearance as if the germ-epithelium (pseudo-epithelium, Balfour) passed downwards into the ovary in the form of tubular open pits, as was described by Waldeyer and his predecessors. No real tubular structures, from which Graafian follicles are formed, exist in the mammalian ovary at any stage of its development. Graafian follicles are formed only in one way from the beginning of the ovary to the end of its existence.'

All that I have observed in examining the parenchyma of human foetal ovaries appears to be in accord with the opinions of Balfour and Foulis concerning Pflüger's tubes. The drawing (fig. 1) represents a section of a portion of the parenchyma of the ovary of a seven months' foetus. The section was prepared for me in the physiological laboratory of St. Bartholomew's Hospital by my friend Dr. Vincent Harris. Here the ova are clearly arranged in the 'meshes' of the stroma. In this specimen several of the clefts and furrows on the surface existed; such would have been taken by Waldeyer for tubes. But the germinal epithelium, unchanged in character, covers the entire contour of each cleft. To return to the arrangement of the stroma, it will be seen that the usually circular form of its meshes, enclosing several follicles, implies that when the ovary is solid, and not reduced to a microscopical section, these follicles lie in spherical cavities in the stroma. For this stroma, in

growing up around the cells, has enclosed groups of them in all directions, so that these groups lie in cavities of the stroma, and not in meshes. And even if it be the germinal epithelium that grows down into the stroma, the result is the same, the stroma grows around the epithelial cells in all directions so as to

enclose them in cavities.

A glance at fig. 1 will show that if the cavities were tubes cut across, they must be very large tubes indeed, and, as they are all very similar in shape, they must represent a group of tubes running in the same direction. We would naturally expect then that, if a section of the ovary were made in a different plane—that is to say, from side to side, and not from its free border towards the hilum—we should see the tubes in longitudinal section giving a very characteristic appearance. But this is just what never has been seen. Again, as the cavities in the section (fig. 1) are of very considerable diameter, we should expect to find their orifices on the surface of the ovary at least equally



FIG. 1.—1. Section of the Ovary of a seven months' Fetus. *a*, Germinal epithelium. *b*, Primitive ova with trabeculae of stroma beginning to surround them. *c*, Graafian follicles with epithelial lining (membrana granulosa) and ovum in the centre. The stroma has forced its way between the follicles. *d*, A Graafian follicle cut so that only a small segment, not including an ovum, is seen; there are several others in this condition. At *e* the contents and lining of the follicles are not drawn, so as to show the arrangement of the stroma. $\times 250$.
2. A primitive ovum (1, *b*) surrounded by stroma.
3. A follicle from the deeper part of section 1 (1, *c*).
4. Section through a Wolffian tube in the hilum of the same ovary, showing very distinct lining of ciliated epithelium and a small thick-walled vessel near the tube. $\times 400$.

wide. But we find no such orifices, and it is vain to say that the tubes once had openings, but that these openings, and parts of each tube, have become choked off by ingrowths of stroma. This choking-off process is a mere term, a clumsy way of expressing the surrounding of groups of cells by stroma.

As the stroma increases, the cavities lose their circular outline, and become pressed against each other, so that an appearance is produced as though a convoluted tube were cut across in its long axis.

The evidence that the tubes of Pflüger have no existence as such must seriously affect the value of the theories of De Sinéty and Malassez, which are based to a great extent on the doctrine that elements in the germinal layer invade the ovarian stroma, in process of normal development, or under morbid influences. Their 'pathological ingrowths' (*enfouissements pathologiques*) are evidently meant to be on the type of Pflüger's tubes. Still, I do not deny that these distinguished authorities may have reasoned rightly on wrong premisses, and considering the vast amount of labour which it is known that they have expended in the study of ovarian disease, all their conclusions deserve to be most carefully taken into account.

The next question affecting all theories on the origin of ovarian cysts is the nature of 'colloid' deposits in the ovary. Whatever they may be, they have been described by different pathologists as the product of some form of degeneration commencing in the stroma, in the walls of the Graafian follicles and corpora lutea, and in the walls of the large blood-vessels that are found in the ovary. My observations lead me to believe that the change may begin in any of these structures. The 'colloid' deposits are exceedingly common in ovaries at certain periods of life; the observer must be careful when studying this condition to distinguish extra-follicular from intra-follicular colloid growths, and to be certain that he does not overlook appearances produced by the disintegration of corpora lutea and of Graafian follicles that have atrophied without ever having attained their fullest development. This is no easy task, for, putting aside the intricate histology of each essential element of the ovary in its well-developed form, the pathologist must not forget that changes in the stroma and vessels are very frequent. Still more important is it to remember that an infant's two ovaries contain at birth many thousand ova. Waldeyer computes the number at 300,000. What is to become of all these ova? They are complicated

structures, and include epithelial elements; but on comparing a good section of an infantile ovary with another of an adult ovary it will be seen how the former is studded with Graafian follicles, and how, comparatively, these structures are scarce in the latter. On the other hand, the stroma of the infantile ovary is tolerably uniform in the parenchymatous portion, whilst in the adult singular hazy, gelatinous patches and streaks are often to be detected, scattered over the stroma in all directions. Waldeyer, Beigel, and others declare that the follicles do not lie latent till puberty. They ripen and atrophy, and do really form a kind of corpus luteum. The truth must be so, or else several thousands of the follicles atrophy without ripening; there is no third way of accounting for the rapid disappearance of a large proportion of these structures between birth and adult life. In comparing a section of the ovary of a seven months' fœtus with that of the ovary of a child aged three, both in my possession, I was struck with the great diminution in the number of follicles in the latter specimen, after taking the increase of stroma thoroughly into account. The stroma in the older ovary was far less uniform, its fibres were less distinct, and there were suspicious hazy patches between them at certain points. I cannot see that these patches can be explained in any other way than by the theory that they are the remains of follicles.

The development and subsequent retrograde changes in corpora lutea, as distinguished from atrophied follicles, are tolerably well known. The more deeply-seated follicles certainly atrophy in a different manner. The membrana granulosa falls in, its epithelial cells become detached and collect as a granular mass. I have observed this condition, first described by Hermann Beigel, but am not sure that the detachment of cells may not be partly caused by the microtome. The stroma always thickens around the collapsed membrana granulosa, and the result is a sinuous ring (fig. 2, 1 *b*), semi-opaque and continuous at first, but soon becoming incomplete through ingrowth of stroma, and at length nothing is left but a zigzag line of this semi-opaque substance. On the other hand, the complete sinuous ring may become much thickened, probably from continuance of the changes in the surrounding

stroma. Patenko, as well as Beigel and myself, has traced the atrophy of the follicles to the last stage, where a sinuous ring is formed, the ovarian stroma pushing into the sinuosities. The semi-opaque tissue appears to be made of exceedingly fine granules. Patenko describes a further change following atrophy whereby tough, semi-opaque bodies termed corpora fibrosa are formed; these are familiar to anyone who has had the opportunity of examining a large number of ovaries. These bodies represent a condition that is essentially and extremely atrophic—abnormal atrophy of the undeveloped follicle, in fact. I now turn to the reverse change, abnormal development interrupting the atrophic process.

I cannot help thinking that the origin of cystic disease is to be sought from careful and prolonged study of the different changes which follicles in process of atrophy may undergo, when influences which it may be impossible to trace prevent the atrophy from ever being completed. Let the epithelial elements of the original follicle be even but in part preserved, then subsequent changes, the reverse of atrophy, may be readily understood. I have noted the frequency with which the stroma of enlarged ovaries, exhibiting all the traces of cystic disease, is studded with little semi-opaque patches, just visible to the naked eye and not thin-walled. Such ovaries were the fellows of large multilocular cysts, and were themselves enlarged to the size of a small orange, and bore several cysts containing glairy albuminous fluid like the contents of the tumour of the opposite ovary.

I must here refer to a very characteristic specimen already described in a contribution to the 'Journal of Anatomy and Physiology,' by Dr. Vincent Harris and myself, but since then I have very carefully re-examined sections of this specimen. On July 15, 1880, Dr. Bantock removed a large multilocular cyst of the right ovary from a robust young married woman, aged twenty-eight. She had been married nearly two years, and, not having menstruated for several months, believed herself to be pregnant, which was not the case. The left ovary was nearly three inches in diameter, and almost spherical in form; its surface was very slightly puckered at certain points. On section, a large number of thin-walled cysts were found,

varying from one-twentieth to one-twelfth of an inch in diameter. These were mostly Graafian follicles and contained ova. Between the follicles the stroma was very abundant and succulent. It closely resembled the stroma that often lies below the cyst, that represents, in fact, the remains of ovarian tissue, in a large multilocular ovarian tumour. By 'below' I mean between the tumour and its pedicle. There was one very recent true corpus luteum, oval, and seven lines by three in diameter; it had a thin yellow margin, and contained a dark red clot. I must here observe that in cases of simple dilatation of Graafian follicles I have generally found the stroma, on the other hand, much condensed; this favours the view that the dilatation is due to changes which surround the follicles with toughened tissue, preventing rupture for a long time. Simple dilatation of follicles is a very frequent concomitant of ovarian disease, and is not rare independently of that affection. The follicles, in these cases, bulge very freely from the surface of the ovary, whilst in instances where there is evidence that incipient cystic disease exists, the entire parenchyma of the ovary is as a rule uniformly distended. Indeed, dropsy of the follicles differs from common cystic ovarian disease as much as the latter differs from papillary cystic disease of the ovarian hilum. In the first the cysts bulge from the free border of the ovary, in the second the ovary enlarges in a uniform manner, whilst in the third the tissue of the hilum becomes distended, and pushes the parenchyma outwards, the free border of the ovary being long recognisable, until the papillomatous cyst has reached very large proportions. As to the alleged occasional origin of the common form of cystic disease from dilated mature follicles, I cannot say that the theory has been ever disproved, but evidence is strongly against it.

On microscopic examination of the specimen now under consideration, the normal follicles were very evident, and in the abundant stroma that surrounded them were large numbers of follicles in every stage of degeneration. Some were reduced to a sinuous band, many formed fusiform bodies consisting of radiating cloudy structures, bearing traces of degenerate nuclei. In the centre were broken-down masses of pigment.

The bands were very distinctly circumscribed by the surrounding stroma, which sent in filiform processes of elongated and nucleated cells.

Every stage of degeneration of the follicle could be traced, and of the follicular origin of the bands there could be very little doubt. I do not wish to enter here into tedious controversy, further than to remark that Dr. H. S. Gabbett has disputed the conclusions of Dr. Harris and myself on the relation of these 'colloid' changes to cystic disease of the ovaries, and on the intrafollicular origin of the colloid deposit. As to the latter point, I must observe that Beigel and Patenko, working on perfectly different principles from Dr. Harris and myself, have both traced, as we have traced, the intrafollicular origin of the 'colloid' changes. I do not deny that a colloid change may occur in the stroma outside the follicles, but this appears to be simply an increase of the intercellular substance, which becomes unusually granular. In regard to the relation of these changes to cystic ovarian disease, I perfectly agree with Dr. Gabbett that they are found independently of that affection; that they are very frequently seen in healthy ovaries; and that they are important factors in bringing about atrophy of the ovary. But I also have reason to believe that ovarian cystic disease, in a large number of cases, originates in some arrest of the downward progress of the normal degeneration of the atrophying follicles.

Fig. 2 shows sections of the ovary in question. I have not drawn any of the larger follicles in the earlier stages of degeneration, several of which existed in the same specimen, but I have drawn (fig. 2, 1, *a*) a degenerate follicle in its most advanced stage, being nearly effaced, and (*b*) another, not quite so advanced; here a part of the sinuous band remains, elsewhere the stroma has invaded the follicle. These structures bear all the characters which Beigel and Patenko have described and figured as degenerate follicles.

On the opposite side of the section was a large cavity (fig. 2, 2) with a similar sinuous border, within which a second well-defined margin was developed. After careful examination, I satisfied myself that this cavity was not a vein, nor an artery, nor a large follicle, nor a degenerate true corpus luteum. It

must be understood that I apply this term, as Beigel and others have done, to the corpus luteum of pregnancy and menstruation as distinguished from that of a follicle that has never developed. It had no resemblance to any of those structures,



FIG. 2.—CHANGES IN ATROPHYING FOLLICLES.

1. (Mag. 2 inch objective.) *a*. A degenerate follicle nearly effaced. *b*. Another not so near complete effacement; a vein and artery lie close to it.
2. (2 inch objective.) A degenerate follicle from the same ovary, developing into a cyst. Tissue has formed internal to the sinuous border.
3. ($\frac{1}{2}$ inch objective.) The free border of 2 (at *a*) showing a distinct epithelial lining.

all of which existed in the same ovary, nor did it bear any likeness to some Wolffian relics in the deep part of the stroma. On examining the inner margin under a $\frac{1}{8}$ -inch objective, I could detect a distinct lining of cubical epithelium (fig. 2, 3), and such epithelium lined the free margins of all the cavities that existed within the sinuous bands. The cells were never ciliated, although it must be here remembered that the epithelium lining the Wolffian ducts often retains its primitive cubical epithelium, which fail to develop cilia. But the cavities under consideration were far from the tissue of the hilum, and small follicles lay near them. The cells bore a strong resemblance to those of the membrana granulosa in certain stages of its development. I cannot help thinking that it is rational, therefore, to trace the origin of these cavities to changes in follicles.

In the monograph by Dr. Harris and myself, an account will be found of several variations, as we believed them to be, of the process of change in atrophied follicles leading to cystic disease, with sketches of the microscopic appearances. They were from two ovaries, the one more than half an ounce in weight, the other weighing exactly one ounce, and each was fellow to a large multilocular cyst, and removed as suspicious.

In the one case, opaque bodies, some $\frac{1}{10}$ inch in diameter, lay in the stroma, which sent numerous delicate ingrowths between the semi-opaque, sinuous bands of which the body was composed. These ingrowths formed what in a section appeared as a meshwork; but, in the solid body, such a meshwork would rather be formed of planes of stroma intersecting each other, and enclosing more or less completely portions of the semi-opaque material. In the second specimen, where the suspected ovary weighed an ounce, several bodies from $\frac{1}{10}$ th to $\frac{1}{6}$ th of an inch lay deep in the stroma, below some normal follicles and a corpus luteum. These bodies had well-defined oval borders, and were filled with mucoid tissue, containing, as microscopical examination proved, a great quantity of large branched cells, their processes being connected with the surrounding stroma. Further observation has led me to rely less on the evidence of these last two specimens than on that described above at length, which is very frequent in incipient cystic disease. In the first case, I suspect that the sinuous bands within their meshwork were degenerate vessels. Noeggerath describes a similar appearance, and in a large cirrhotic ovary I have seen groups of vessels, with their coats still partially distinguishable, undergoing this colloid change. In the second case, the myxomatous tissue, occupying the centre of the oval bodies, suggested degeneration of the stroma, as such tissue is not supposed to be derived from epithelium¹; moreover, the cells were actually connected with the stroma. Yet, in such a case, some epithelial relics from follicles might furnish a lining to the cysts formed by the breaking down of the myxomatous tissue, and, in this case, two such cysts were formed. I did not, I must admit, find any trace of an epithelial lining in these cysts, as in fig. 2, 3. As for the formation of epithelium from connective tissue, that involves questions of importance in general pathology, and its possibility is denied by many; certainly, I could trace no evidence of such a process in this case. I agree with Dr. Gabbett that if the degeneration takes place in Graafian follicles, the process must

¹ This specimen recalled the invasion of cystic cavities by colloid tissue developed in the stroma, as figured by De Sinéty and Malassez, *Archives de Physiologie*, 2nd Series, vol. vii. 1880, plate xviii. fig. 1.

be traced from its early to its latest stages; this could be done in the specimen first described, but not in that where myxomatous patches were to be found. I also agree with that pathologist in his opinion that we must not consider every morbid appearance in an ovary to be necessarily connected with cystic disease.

The changes in the large blood-vessels of the ovary, from which Noeggerath attempted to trace the origin of cystic disease, are certainly very frequent in ovaries where no such disease need be suspected, and I cannot say that I believe so much in Noeggerath's theory as I did in 1881, for I have searched many ovaries since then, and found that when cystic disease was most reasonably suspected, it was not vascular nor myxomatous changes that prevailed, but distinct alterations in the process of atrophy of undeveloped follicles, resembling, in their early stages, the conditions accurately described by Patenko, Beigel, and Slavjansky.

As to the theory of De Sinéty and Malassez, although the tubes of Pflüger do not exist, the pathological ingrowths of which they speak probably represent follicles ill-developed from the very earliest stage, when first they became surrounded by stroma. Foulis's theory, still too theoretical for practical inferences, that the follicular epithelium is derived from the connective-tissue cells of the stroma, would seem to imply that the stroma might, in some cases, develop follicular epithelium independent of germinal-epithelial cells which they surround, and which, as nobody now doubts, become ova. In fact, follicles without ova would thus be formed. I have made some reference to this matter in the Preface to this work. It is more likely that the pathological ingrowths are masses of follicular cells remaining after the absorption or destruction of ova, and, therefore, very liable to set up disease. In this chapter, however, I have described what I have seen, and it is what I have seen that leads me to believe, for the reasons already given, that the most probable origin of cystic disease of the ovary is an arrest of the normal retrograde metamorphosis of Graafian follicles that have never become corpora lutea of menstruation or of pregnancy.

Within the last twelve months Mr. F. S. Eve has described,

in a course of unpublished lectures given at the Royal College of Surgeons in 1883, a series of changes within the stroma of ovaries affected with incipient cystic disease, that fully coincide with my researches, though explained in somewhat different terms. I have seen some of the microscopical specimens on which his opinions are founded, and observed collections of follicular epithelium undergoing great extension of area, pushing inwards towards the follicular cavity, and outwards into the stroma. This is a stage further towards the development of cystic disease than I have been able to trace in my own specimens. The epithelium of these altered follicles bore all the characters of that which lines the more primitive follicles in a healthy ovary. The process had evidently commenced very early in the retrogression of the affected follicles. Mr. Eve lays some stress on the formation of follicles and ova after birth. I have no further space for discussing his interesting researches; I only remark that the most recent labours of embryologists and pathologists all point to a follicular origin for cystic disease of the ovary.

Lastly, in discussing the development of multilocular cysts, we must not forget the structure of the full-grown cysts themselves. I will reserve for the next chapter the consideration of the epithelium that lines the cavities of such cysts, an epithelium quite unlike that on the surface or in the follicles of the normal ovary at any age, and I will also show that certain appearances taken for colloid changes are essentially epithelial.

CHAPTER II.

MULTILOCULAR AND GLANDULAR OVARIAN CYSTS.

THE common multilocular cyst of the ovary has been very often described by pathologists. Some notice of its rarer varieties, where it is sessile, mixed with dermoid growths, or presents other peculiarities, will be found in chapters devoted to special subjects; and other sections of this work deal with the changes and accidents which are more or less frequent in the history of a multilocular cyst, and with its origin and its relation to cysts of the hilum and the broad ligament.

A multilocular cyst generally presents a smooth surface when felt through the abdominal walls, but may be very irregular, when the secondary cysts project freely from under the main cyst wall. If one cyst contain much more fluid than the rest, and at the same time be not very tense, fluctuation will be evident, and there will be a distinct thrill on percussion. I am referring now to uncomplicated cases.

When the abdominal incision is made, the surface of a healthy multilocular cyst appears smooth, glistening and almost silvery, owing to the great amount of fibrous tissue in its walls, especially if those walls be thick. When a simple broad ligament cyst is exposed, the wall is sometimes so thin as to give the tumour a dark appearance, the fluid showing through the wall, or it may look like a uterine growth, owing to hypertrophy of the muscular fibres of the broad ligament. The appearance of a myoma of the uterus is very characteristic. In short, there is no difficulty in recognising a healthy multilocular cyst. When the surface of the exposed tumour is not glossy, this may indicate dermoid contents, twisting of the pedicle, or simple degeneration or inflammatory changes in the walls. Circular patches of thinner and duller, but still

smooth, tissue indicate the presence of large secondary cysts developed in the main wall of the tumour.

On plunging the trocar into the wall of a typical multilocular cyst, a quantity of a glairy albuminous fluid escapes, often to the amount of several gallons. It may be almost colourless like clear boiled sago, but is generally of a greyish tint. Very often it appears to be stained of a rich, dark, reddish-brown hue, sometimes described as 'chocolate colour,' but it is only the semi-solid material mixed with fat, often found in the cavities of dermoid cysts, that thoroughly resembles chocolate in appearance. In both cases, however, the dark colour is due to changes in extravasated blood. When solid growths spring in abundance from the secondary cysts, the fluid is particularly glairy, and often semi-solid opaque white masses escape from those cysts. True colloid changes produce the characteristic pale-orange jelly-like material that gives great trouble to the operator, as it cannot run through the cannula, and when broken up by the hand much hæmorrhage into the cavity of the tumour is often set up before the pedicle can be reached and secured; besides, the main wall of the cyst is usually soft in these cases, and easily ruptured by the fingers or knuckles, yet it is particularly advisable not to allow any colloid material to escape into the peritoneal cavity. When perfectly clear fluid, devoid of glairiness, escapes from some of the secondary cysts, these will almost invariably be found to contain papillary growths, readily distinguished from the glandular masses more frequent in true multilocular cysts; but perfectly smooth-walled secondary cysts may contain clear, non-albuminous fluid.

The glairiness and greyish or yellowish-grey colouration of ovarian fluid is a physical characteristic practically sufficient for diagnosis from ascitic fluid. Chemical tests for ovarian fluid are not satisfactory and are of a kind unsuitable for the surgeon who cannot keep up more than a superficial knowledge of the science of chemistry, nor carry spectroscopes and other apparatus about with him; nor are medico-chemical authorities yet agreed upon a perfect test for ovarian fluid. 'We have no one characteristic that can enable us chemically to distinguish between the fluid of an ovarian cyst and the contents of

a cyst of another organ,' writes Dr. C. H. Ralfe. 'If the solid constituents be above that of ordinary blood serum, we can say positively the fluid is not ascitic, but otherwise we have to depend on an examination of the whole constituents of the fluid before we can venture to form an opinion.' I will pass over the subject of the large vacuolated cells, already described by Foulis and Thornton as characteristic of malignant disease. Their presence is a serious matter as regards prognosis, but I have repeatedly observed them where the solid growths in a cyst were purely glandular. More will be said regarding this subject in Chapter XII., in relation to a case of papilloma of the Fallopian tube, where proliferating and vacuolated cells abounded in the fluid which filled the peritoneum, yet the after-history of the case was conclusive as to the absence of malignant disease.

Secondary cysts certainly break through the main cyst wall in many cases, and this will be considered in the chapter on rupture of ovarian cysts. Undoubtedly in some cases the protruding secondary cyst does not rupture, but merely stretches the main wall, forming a prominence, and other cysts may follow it. Nor can it be doubted that the main wall may rupture, and, its walls undergoing atrophy, the secondary cysts will then form a tumour, in shape resembling a pile of cannon balls. This is the exogenous cyst, as it is sometimes termed. I certainly believe that true exogenous cysts may exist; I mean collections of two or more cysts that were independent of each other from the first, never having been included within a common main wall. In a woman forty-five years old, where both ovaries were removed by Mr. Thornton, one was converted into an ordinary multilocular cyst. The other formed an elongated tumour a foot long, made up of cysts full of glairy fluid, and completely separated from each other by hypertrophied ovarian tissue. In eight cases where I have assisted at operation, the tumour has been a cluster of cysts, but in all but that just quoted there was no evidence that they were truly exogenous in the sense above indicated. The false exogenous cyst—that is, a collection of secondary cysts that have burst through a main wall—is a serious form of tumour very prone to rupture, often filled with solid growth, and especially liable

to contract adhesions. Omentum and intestine adherent to the deep grooves between the cysts are very troublesome to separate.

The false exogenous cyst can often be recognised by the thin and very vascular walls of the secondary cysts of which it is made up. The tendency of secondary cysts to open into each other when in proximity, through simple atrophy of the contiguous portions of their walls, is very marked in most cases, and it is not surprising that multilocular cysts of both ovaries not unfrequently become fused. The main wall of each tumour suffers from pressure in various ways, so as to become thinned, and the secondary cysts of the one can readily burst into the secondary cysts of the other.

These double fused ovarian cysts are of great clinical interest, and very troublesome and puzzling to the operator, especially if there be many adhesions in the pelvic region. In the five cases where I have been present at operation the second pedicle, that is, that which was recognised as a pedicle after another had already been detected, was usually taken at first for an adhesion, and one of the two pedicles was always much smaller than the other. It is possible that in other cases a twisted pedicle may have been taken for a pelvic adhesion. For in cases of double cystic disease the pedicle of one tumour may become twisted, and the tumour might then adhere to, and also receive its nutrition from its fellow. Should deep pelvic adhesions exist, the operator might readily separate the twisted pedicle as such, and fearing to handle the pelvic structures in too searching a manner, might be under the impression that he had left behind 'the other ovary, buried in adhesions.' An ovary actually in that condition, or atrophied, is not always easy to recognise.

Of the cases of double and fused cysts, which I have seen on the operating table, the most serious was in a woman aged forty-four. On tapping the tumour, and drawing it out of the abdominal wound, a very broad and narrow pedicle was discovered; it included the left Fallopian tube. This pedicle was very hard to secure; it had to be transfixed in two places by the needle armed with a double stout silk ligature. A long narrow band, resembling a pelvic adhesion, bound down the

lower part of the tumour on the right side. It was found to be a true pedicle, containing the right tube and ovarian ligament. The abdominal walls were very fat, and the patient died with septic symptoms on the fourth day.

In another case, the patient was thirty-nine years of age; the abdomen was much distended, and its integuments œdematous; the cyst was very tense, and its surface irregular, so that there was some suspicion that a uterine tumour existed. On vaginal examination the uterus was found to be pushed to the left, and it did not move freely when the sound was introduced into its cavity. A very large multilocular cyst was removed at the operation, and a short broad pedicle connected it on each side with the uterus; both were secured, and the patient recovered.

The third case was that of a woman aged thirty-five. The tumour had been tapped a few months before its removal by Dr. Bantock. When the abdominal wound was made, the outer wall of the tumour appeared dull, and on removing the fluid a number of small cysts were found, collected into one mass behind the cyst first exposed; the fluid which they contained was ovarian, and mixed with pus. The cyst nearest to the abdominal wound had leaked considerably since the tapping, and allowed the escape of a great amount of fluid into the peritoneal cavity, causing inflammatory ascites; there were also abundant peritoneal and omental adhesions. A distinct pedicle, with the Fallopian tube readily recognisable, and bearing the normal relation to the cyst, was found springing from each side of the uterus. A drainage tube was passed into Douglas's pouch, and the patient made a good recovery.

The two next cases, by a curious coincidence of a kind not rare in clinical records, were operated upon within six days of each other at the Samaritan Hospital. One was in a patient under Mr. Thornton's care. The patient was fifty-six years of age. The tumour was large, and composed of but few cysts. There were strong pelvic adhesions; some lay deep in Douglas's pouch; another lay close to the common iliac artery. The relation of the Fallopian tube, in each pedicle, to the tumour was very evident in this case. The operation took a hundred and ten minutes, the separation of adhesions proving particu-

larly irksome. A drainage-tube was passed into Douglas's pouch, and the patient made a good recovery.

The last case was that of a patient in Dr. Bantock's wards; she was fifty-five years of age. The tumour formed a great mass full of colloid material, which escaped into the peritoneal cavity, the cyst wall being very soft and readily lacerated. There were abundant adhesions to the parietes and intestines, one binding the sigmoid flexure intimately to the back of the cyst; the left pedicle was easily recognised, the Fallopian tube being distinct; on the right side the tumour was connected to the uterus by a stout and short pedicle, the different tissues of which could not be distinguished, but no right tube or ovary could be found. Portions of the main cyst wall had to be left, adherent to the parietes, and a drainage tube was employed. The patient recovered.

Thus, out of the five cases of double fused ovarian cyst where I have witnessed the operations for that removal, one terminated fatally, and all were very troublesome to the operator. In all, the pedicles were secured by transfixion, the process being invariably difficult. As a rule adhesions existed; and the uncertainty produced in the minds of the operator and his assistants, when an anomaly of this kind is first inspected, is an element which adds to the tediousness of cases of this description.

I must here mention a sixth case, which differed from the others in that the true pathological condition could not be made out during the operation. The patient was about thirty-five years old. A large multilocular cyst was discovered at the operation; it adhered to the parietes, the omentum, the ileum at several different points, and the vermiform appendix. A capsule, really the outer layer of the main cyst wall, was peeled off the cyst, and the lowest part of the tumour that could be reached was transfixed twice and treated as a pedicle; some vessels in the portion of the capsule left behind were secured. About two inches of the vermiform appendix had to be cut away, being inseparable from the cyst; this portion contained a plug of solid feces. The shock was very severe, and the patient hardly survived the operation one hour; at the necropsy I found that two true pedicles existed; they passed on to the

lower surface of the portion of the tumour that had been left behind and ligatured.

Out of 605 cases of ovariectomy, oöphorectomy, hysterectomy, and other forms of abdominal section where I have been present—this series commencing on November 15, 1877, and ending on March 25, 1884—I find, on referring to my notes, that 366 were operations for the removal of multilocular ovarian tumours. Out of these at least forty-eight were double, including the six cases of fused cysts already recorded, and in nearly twenty more cases suspiciously enlarged ovaries were removed after the cystic tumour had been cut away, the forty-eight comprising only those cases where the smaller tumour was a multilocular cyst three inches or more in diameter. In the above 366 cases I include all multilocular tumours where the secondary cysts contained no solid contents, or were partially or completely filled with colloid or glandular growths, by which last term I mean new formations which the pathologist would describe as adenoma or adeno-sarcoma. I include sessile multilocular cysts, with or without glandular contents—described in another part of this work—but for pathological reasons, which I will explain elsewhere, I exclude all cases where cysts, however undoubtedly ovarian, contained papillary growths. From the forty-eight cases of double multilocular ovarian cyst, I, of course, exclude cases where one tumour was dermoid or completely solid. Statistics of such cases will be found in other chapters.

It is not possible to classify multilocular cysts by the number of their loculi; indeed, in many cystic tumours that were practically unilocular I have found, not only the characteristic fluid and even glandular growths, but also abundant traces of broken-down septa, whilst in other cases the secondary cysts were countless. I will return presently to this question of cavities. It is likewise impossible to separate multilocular cysts without glandular contents from those that include such growths within their cavities; at least, this cannot be done with any precision, as, in a small tumour that has been removed within a few months after the patient has first observed an abdominal swelling, a very slight irregularity in the lining membrane of a secondary cyst may represent what would have become in a year or two

an extensive mass of solid deposit. Out of the 366 cases, however, in twenty-six the tumours contained much solid growth. In fourteen this growth was distinctly adeno-sarcomatous. In twelve the solid matter was very malignant in appearance; in one of these it bore the microscopical characters of round-celled sarcoma; in two, at the very least, the growth was colloid cancer; in most of the nine remaining cases the general naked-eye appearances of colloid cancer were present, but I had no opportunity of examining the specimens microscopically. In over one hundred cases I observed distinct traces of glandular growths; and as over one hundred more were small and recently developed tumours which would probably have developed such growths, it is evident that the tendency for adeno-sarcoma to develop within the cavities of ovarian cysts is very great.

The outer surface of the main wall of a typical pedunculated multilocular cyst, not involved in any inflammatory or degenerative process, is, as is well known, and has been before observed, smooth, glistening, and silvery white in appearance. It varies considerably in thickness, according to its degree of distension from fluid, cystic, and solid contents. When it contains much fluid, even to the extent of many gallons, its coats may still remain strong enough to resist considerable violence without rupture; distension alone, without softening or degeneration from twisting of the pedicle, producing but little direct effect on the periphery of the tumour. When secondary cysts abound within the main wall, the latter is very liable to become thin, not necessarily from inflammation or degeneration, but from mechanical causes, especially great local distension, a secondary cyst forcing it outwards. The development of cysts of this kind, in the very substance of the main wall, causes it to become particularly thin and soft. In cases where the secondary cysts contain glandular material, the main wall is generally thin and relatively soft from the first, the connective tissue within its substance is more or less embryonic; as well-formed fibres are not freely developed where such tissue exists, the main wall, in cases of this kind, generally lacks lustre, and, instead of appearing silvery, it assumes a greenish grey and semi-transparent appearance. When we also bear in mind the changes which adhesions, inflammation, atrophy from twisting of the pedicle,

and from blocking of the vessels within the wall itself, may produce, all altering the appearance of the outer aspect of the entire tumour, we may draw a corollary from the above, and actual observation will bear out this corollary, which is, that the smoother and shinier and the more silvery the cyst wall appears, when exposed by abdominal incision, the better the case will be both for the patient and for the operator.

Nevertheless, I have seen one case at least where a multilocular tumour, bearing all these external appearances, proved, when it had been emptied by means of the trocar, to be very intimately adherent to the brim of the pelvis. When the pedicle is unobstructed, and when the adhesions arise from local inflammation, not of the cyst, but of contiguous parietal peritoneum, omentum or intestine, the outer wall of the cyst may remain unaffected except around the seat of adhesion.

A dermoid cyst has very seldom a smoothy, shiny, and silvery outer wall, unless a portion distended with clear fluid, and devoid of dense solid deposit, presents towards the abdominal wall. As a rule, such a cyst is externally more or less dull green or grey in hue, with orange or ochreous patches. A simple broad ligament or 'parovarian' cyst can be recognised by the thinness of its walls, allowing the fluid to be seen through it; but sometimes the walls contain great quantities of fibrous tissue, so as to appear silvery and shiny; in these cases the transparent fluid can be sometimes seen, or rather recognised, where there are gaps between the meshes of fibres. In many cases these cysts cannot be diagnosed from multilocular ovarian cysts by the appearance of the outer wall alone. Cystic uterine tumours have a glossy and pale-red appearance, and the walls are generally thick and resistant. Cysts of the broad ligament with solid contents, many simple broad-ligament cysts, and multilocular papillary cysts of the hilum of the ovary, as well as ovarian cysts of the more frequent type that have part of the broad ligament reflected over them, have often a reddish surface, the colour being produced by the plain muscular fibres within the broad ligament. Hence there is often much difficulty in distinguishing them at first sight from cystic uterine tumours.

On the surface of otherwise perfectly healthy multilocular ovarian cysts, numerous red patches, made up of collections of dilated vessels, may generally be seen; also small oval or circular areas bluer and less silvery than the remainder of the surface of the cyst; these areas are devoid of epithelial or endothelial covering.

De Sinéty and Malassez have minutely described sundry vegetations found on the surface of multilocular ovarian cysts. I have frequently observed both the 'connective-tissue vegetations,' and the 'mixed vegetations' of which they speak. I agree with them in assigning little clinical importance to these structures; they, strange to say, bear no relation to the contents of the interior of the cyst.

In about twenty cases I have found singular little pedunculated growths hanging from the main wall, far from the pedicle. Still more frequently small, thin-walled cysts, lined with endothelium, project from the surface of the tumour; they are pathologically homologous to similar cysts developed between the folds of the broad ligament, and described elsewhere. The pedunculated growths to which I refer are masses of connective tissue, sometimes partly cystic. Care must be taken in investigating these growths to make sure that the ovarian cyst is not partially invested with the folds of the broad ligament, or has burrowed under the peritoneum. When this is the case, these structures are more frequent than in typical pedunculated cysts. This might be expected with regard to the thin-walled cysts so frequently developed in connection with serous membranes. Yet I have often seen such cysts in typical cystic ovarian tumours bearing long pedicles, and in no way invading the peritoneum.

The connective-tissue growths described by De Sinéty and Malassez are very frequent; they may appear as elevated, flattened, opaque patches, consisting of dense fibrous tissue, or as small tubercles of young connective tissue mixed with minute thin-walled cysts developed in the new growth. Such growths are not rare on atrophied or on otherwise normal ovaries. In 1879 I found a mass of these growths upon an ovary removed for the cure of menorrhagia, and I also observed a similar collection of connective tissue forming a group of papillary out-

growths on the surface of the atrophied ovaries of a lunatic, aged thirty-eight, whose uterus was imperfectly developed, and, in the same year, I discovered precisely similar growths on the surface of ovarian cysts. They are, it would therefore appear, essentially ovarian, and not necessarily connected with cystic disease.

The 'mixed growths,' described by the same author, are pathological curiosities. They often appear as little red, fleshy wattles or caruncles, sometimes bearing a strong resemblance to Fallopian fimbriæ. They bear a covering of low, cubical epithelium. I have found their substance to be entirely nævoid in some cases. The French pathologists, above quoted, claim to have found ciliated epithelium upon some of these mixed growths. If so, they must surely have been detached from the fimbriæ of the Fallopian tube; it is not rare to find a portion of the ovarian fimbria of the tube completely detached from the rest of that fringe, lying on the surface of an ovarian cyst, and this might become the seat of a growth.

None of these growths are identical with the true papillomatous masses which spring from hilum cysts and broad-ligament cysts, nor with the glandular, solid contents of the typical multilocular cysts under consideration, for neither of these two forms of intracystic growth tend to develop spontaneously on the outer surface of a cystic tumour. When true papillomata are found in that situation, they, in my experience, can always be traced to rupture of the cyst wall from rapid growth of intracystic papillomatous masses and subsequent dissemination; or the infection may have spread from the broad ligament. The presence of glandular growths on the surface of a cystic tumour is also invariably to be traced to infection from within, set up by rupture, or to similar infection from a similar tumour of the opposite ovary. In none of the fifteen cases examined by De Sinéty and Malassez 'did any internal growths project from the exterior through an opening in the main wall, in the manner so frequently observed within the cyst, between adjacent loculi.' I have twice seen glandular growths projecting through the main wall, and on several more occasions have I observed papillomatous growths perforating the main wall; more will be

found on this subject in the chapter on rupture of ovarian cysts.

The outer surface of the main wall of a typical multilocular cyst is invested with a layer of low columnar or cubical epithelium, according to most authorities, but in a large number of specimens of large cysts which I have examined the cellular covering of the tumour was perfectly endothelial in appearance, nor, after repeated examination, could I detect any cubical or columnar epithelium. De Sinéty and Malassez state that the outer or peritoneal surface of these cysts displays an epithelial covering formed of short cylindrical cells, with an incomplete endothelium beneath it. I cannot enter into general histological questions as to the relations of endothelium to epithelium, and the alleged existence of the former, in some structures, beneath layers of the latter, nor am I prepared to say that the endothelium is derived from the peritoneum, so as to present a cellular uniformity which does not exist between that serous membrane and the surface of a healthy ovary. On small cystic tumours under six inches in diameter, I have often found cubical epithelium, but this I have only seen as an exception in large cysts. It is most probable that the change in the epithelium is due to distension and alterations in nutrition. In any case the outermost lining of the main cyst wall in large tumours bears all the appearances of endothelium.

The middle coat, as it may be termed, of the main cyst wall is composed of connective tissue, always well developed in typical cases; it is often aponeurotic in appearance, white and elastic fibres, especially the former, abounding. Plain muscular fibres are also present, and can be traced to the ovarian ligament, which is almost entirely made up of that tissue; in its proximity, therefore, fibres of this kind predominate, in the middle coat of the cyst wall, over white and elastic fibres. As in all fibrous structures, this coat may be divided into two, three, or more lamellæ by dissection. In its substance run the vessels which supply the tumour; these are small and regularly distributed in the more typical and innocent kinds of cysts, large and irregular when solid intracystic growths exist to any considerable extent. Morbid changes

in the vessels are almost invariably present to a limited extent in typical cases. I shall reserve this subject, however, for the chapters on rupture of the cyst and twisting of the pedicle—matters with which vascular disease is intimately related.

Within the substance of this coat a process of cyst formation is often to be detected; sometimes small cavities lined with columnar epithelium are to be seen. On the other hand, secondary cysts of large size certainly appear to develop in this coat, and such cysts I have ever found to be lined with endothelium. I shall presently revert to this subject of epithelial and endothelial structures developed in proximity. Traces of normal ovarian tissue may often be found in this coat: I have discovered a corpus luteum of some three or four weeks' growth several inches from the pedicle. On the surface of the cyst wall near the pedicle, the peculiar wrinkled appearance presented by the tissue of the ovarian hilum may often be observed, and, if developed to any great extent, papillomatous growths will almost certainly be found amongst the loculi of the cyst.

We now come to the inner lining of the main cyst wall. If secondary cysts be very abundant, which is not the rule, no one loculus predominating greatly in volume over the others, it will be impossible to define a continuous lining to the main wall. As a rule, however, one cyst greatly exceeds the remainder in its capacity. In that case, especially if the large cyst be tense, its lining bears all the characters of endothelium. It may have originally been epithelial in character, and have altered through pressure, as in the case of the outer surface of the cyst wall. Mr. F. S. Eve and others have observed a similar change in the process of cyst formation in the testicle. This inner lining in very tense cysts appears smooth and glistening. In May 1879, Mr. Thornton removed a very large cystic tumour of the ovary from a woman aged fifty. There was a main cyst holding several gallons of very clear but viscid ovarian fluid and numerous secondary cysts containing rather thicker fluid. I found, on staining the inner wall of the large cyst, that it was invested with a perfect layer of endothelium, whilst the smaller cysts were lined with long

columnar epithelial cells. The difference in the fluid contents, as above noted, is significant.

Very frequently, especially if not very tense, the main cyst bears internally a layer of vascular mucous membrane, for so it may fairly be termed. This layer may be freely dissected off the middle coat, from which it is separated by true sub-mucous tissue containing lymphoid elements and plain muscular fibres, and it bears true columnar epithelium; it is thus transitional between the endothelium of tense cysts and the complicated epithelial structures investing the glandular growths of the secondary cysts.

Passing over the singular results due to vascular changes, the ochreous patches and areas of hyperæmia, congestion, and atrophy, to be referred to in another chapter, the loculi will now engage our attention.

It is impossible to draw a line between multilocular cysts that are literally multilocular and other cysts which contain but few or even no septa, yet in other respects bear all the characters of the typical ovarian cyst. Terms like paucilocular and oligocystic are clumsy and unscientific, especially as they tend to confound small typical cysts with large specimens of dropsical Graafian follicles. We have at present only to do with the former, and it is best to retain the name multilocular ovarian cyst, as implying a tumour of the ovary, one of the most constant characteristics of which is division into several or many compartments. If, as is the case, there be but one cavity within the main wall, and all other characteristics remain the same, the name may, in accordance with scientific principles, be retained. A name is a symbol, a denomination, and not a definition: were it to be attempted to make names serve as definitions, endless confusion would ensue. Biologists do not turn the *Thylacinus* or Tasmanian 'wolf' out of the order *Marsupialia* because that animal has no marsupium. Although a tumour is not quite so distinct a unit as is any species of animal or plant, pathological nomenclature should be applied on the principles adopted in other sciences.

When one cavity is so predominant that the tumour appears literally unilocular at operation, careful examination will seldom fail to show secondary cysts projecting under its inner lining

membrane, generally towards the site of attachment of the pedicle. In such a case, the predominance of secreting power over secondary cyst and new-growth-producing power has been given as an explanation of the character of the tumour; but, after all, this is but a pedantic way of describing the tumour under pretence of explaining the cause of its peculiar construction. This predominance of one cyst, with almost complete absence of secondary cysts, is often held to be a sign that the tumour is of the most innocent character possible. It is more correct to say that such a tumour is still in its most innocent stage. I have seen operations on cases where large, tense, and freely movable cysts had previously been repeatedly tapped, the fluid, as usual, being clear, and only slightly glairy at the earlier tapplings, and becoming more glairy, darker and thicker the more frequently paracentesis has been performed, thus assuming the characters of fluid found in highly multilocular cysts. In such cases a number of secondary cysts have usually been discovered, and there can be little doubt that there would not have been so many secondary cysts had ovariectomy been performed before the first paracentesis. The removal of fluid pressure no doubt aided the growth of these cysts. On the other hand, the escape of several pints of clear and moderately glairy fluid through the trocar during operation must not lead the operator to suppose that there are few secondary cysts; on attempting to draw the collapsed tumour out of the abdominal wall, he may be surprised to find that its base is stuffed with secondary cysts, filled perhaps with glandular or even sarcomatous matter. As a rule, however, I have found that the predominance of one cyst is a favourable sign, indicating the simplest form of tumour.

Indications of the breaking down of septa are extremely common in the cavities of these predominating cysts, and may also be seen within secondary cysts. Several writers have taken the pains to discuss whether these septa be in process of formation or in process of destruction, but there can be little or no doubt that they are in the latter condition. I have repeatedly examined multilocular cysts, so as to be able to trace every intermediate stage between two or three secondary cysts lying on the inner wall of the main cyst to the perfectly multilocular

condition, the cavity of the entire tumour being subdivided into loculi of tolerably equal capacity, loculi lined with the same kind of inner wall, and bearing the same kind of growths as the distinct secondary cysts. Close packing of these cysts must of necessity change their spherical walls into polygonal septa. In some places young connective tissue is freely deposited in the substance of the septa; in others the septa become very thin, and then rupture. A thickening of the substance of the septum along the margin of the rent is frequently seen, and I have found a secondary growth that had protruded from its parent cavity through a rent in the septum into the neighbouring cavity, tightly nipped, and indeed partly strangulated by a thick ring of tissue formed in this manner. When a solitary secondary cyst projecting from the inner side of the main wall bursts, its wall appears, some time after rupture, as a ring of fibrous tissue lying on the main wall, with a base consisting of its former lining membrane; this condition has been taken for ulceration. I shall revert to it in speaking of rupture of the cyst (fig. 26).

The tendency of a rupture in the septum between two secondary cysts or loculi is not to remain stationary by thickening of the edges of the rent, but rather to increase; and as the process of rupture often occurs simultaneously in several loculi, a curious appearance is produced—a collection of elevated fibrous structures, with large holes in them, lying on the inner wall of the main cyst. These become, in course of time, mere narrow fibrous bands, interlacing, and ultimately appearing as white, glistening, very wide-meshed elevations on the main wall. Thin-walled cysts lined with endothelium often form on the fibrous relics of broken-down septa, and these relics may partially chondrify. Of course it is highly important, pathologically speaking, to determine, when examining an apparently unilocular cyst, whether such traces of septa exist. If they do, as is generally the case if the tumour has existed for a long time, the significance of the single cavity is evident. If none are found, as in tumours that have not been long in growing, then no doubt the single cavity has been single from the first.

In twenty-six out of 366 cases of multilocular cystic disease of the ovary which I have examined, there was a con-

spicuous amount of soft solid growth in the secondary cysts or loculi. I have never seen a growth of this kind projecting into the cavities of a tumour consisting of very few large cysts, nor do I expect to see such a case, there being in fact, and under any theory already propounded, a relation between abundance of secondary cysts and abundance of solid growth. That this growth is not found in association with cysts filled with the clearer type of ovarian fluid is also what might be expected, the thicker type being a secretion from the growth, or at least the dense glairy fluid bears some inseparable relation to the succulent solid matter.

On cutting into a multilocular cyst, with solid matter in its cavities, well-known appearances are produced—a mass of thin but rather opaque-walled and vascular secondary cysts project into the main cyst cavity; these cysts on section show the characteristic masses of glandular matter—semi-transparent and pale greyish green in tint—and the free cavities which they still leave in the cysts or loculi which they occupy are filled with a glairy fluid, the colour of egg-albumen, or much more opaque and dead-white; in some cases this mucous fluid is almost as tenacious as treacle, and oozes from the cut surface of the solid matter. This solid growth is exceedingly soft, and is readily broken down by the hand of the operator, when such a manœuvre is necessary, before the entire tumour can be drawn through the abdominal wound. Sometimes, in the midst of the most solid part of these growths, masses of thin-walled cysts containing clear fluid are found; they are lined with endothelium, and appear to be connective tissue productions, possibly derived from the endothelium which is said to line all lymph-spaces in connective tissue. They seem to be homologues of the cysts developed in the main wall, as already described. Here, as in the main wall, cysts with endothelium are being developed in proximity to epithelial structures, only here the latter predominate; in the main wall the smaller cystic cavities appear to have epithelial, the larger endothelial linings. When the latter enlarge, they remain thin-walled; their lining is still endothelial, and their fluid contents almost free from glairiness. So it is with these thin-walled cysts in the solid glandular intracystic matter. In one tumour I found

two or three dozen of these cysts, some over an inch in diameter. Their attachment to the soft tissue which surrounded them was so slight that they almost slipped out of their matrix as the tumour was cut across by the dissecting knife, and they contrasted strongly with the cavities into which the solid matter projected. On the other hand, the deeper part of the solid matter not unfrequently contains chondrified patches. I found such patches in a multilocular cyst removed by Sir Spencer Wells in 1878; the secondary cysts were not very numerous, and few were more than partially filled with the growths, which were essentially glandular, and secreted very glairy fluid; there was not a trace of any dermoid growth. This chondrification is evidently analogous or identical with the growth of cartilage seen in sarcoma of the parotid gland, testicle, and other organs.

The free surface of the glandular growths must be examined with care, and the observer should choose the larger cavities into which they project, as there is then all the more surface to study. The surface is always very irregular, sometimes granular and tuberos; frequently papillary masses project in all directions. These must never be confounded with the true papillomatous growths characteristic of hilum cysts. The latter have very little connective tissue behind them; they form masses of fine, brittle, gritty tags that sprout direct from the wall of their parent cyst, which contains no soft and succulent solid matter, and the fluid contents are always watery. I have had several opportunities of examining mixed cysts, with the typical glandular growths in close relation to true papillomata. The glandular papillary growths in these cases showed very distinctly from their true papillomatous neighbours. Where the latter prevailed, clear fluid predominated; in the direction where the former grew, the free contents of the secondary cysts were glairy. But more will be said of papillomata in another chapter. They have ever appeared to me as utterly distinct from glandular growths. Even when glandular growths are not rich, as usual, in young connective tissue under their epithelium, I have found that they still secrete glairy and not clear fluid.

The microscopical features of this glandular material must now be considered. I shall continue to describe what I have seen with full deference to the varied opinions of Wilson Fox,

Stricker, Olshausen, De Sinéty, and Malassez, and numerous other pathologists, not forgetting the younger Dr. Ritchie, who associated with Sir Spencer Wells early in his career as an ovariologist, and, examining a large number of cysts removed by that surgeon, was cut short only too soon in labours of the same kind as those which I am now recording. In six different samples of advanced glandular growth the appearances were as follows:—

Fig. 3, 1, represents the naked-eye appearances of a section of a glandular mass from a secondary cyst. The patient was twenty-seven years of age in June 1880, when Mr. Thornton removed a large multilocular cyst of the right ovary, which had a broad pedicle. One cavity predominated; its inner coat was very smooth, but had the appearance of mucous membrane, and

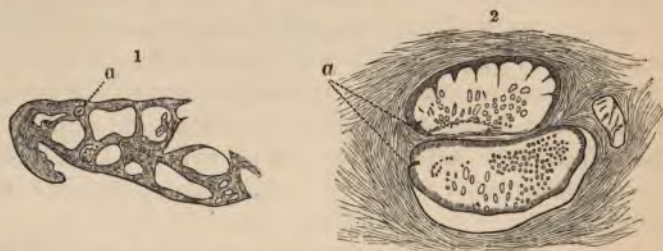


FIG. 3.—1. Section of a glandular growth from the interior of an ovarian cyst, natural size.
2. The part of the same marked *a* in 1, as seen under a half-inch objective.

the fluid contents were glairy. Several secondary cysts projected into its cavity. These cysts were filled with the solid masses, from one of which the section here figured was prepared. The cavities are separated by much connective tissue, and small growths may be seen to project into them. In several other sections which I have examined, the connective tissue between the cavities was exceedingly scanty, so that they appeared as a network of fibres lined with epithelium. In others the connective tissue was very abundant and embryonic, including sarcomatous matter. The section under consideration is a fair average specimen of the intracystic growth most frequent in a typical multilocular ovarian cyst.

On examining the borders of the cystic cavities in these sections under a high power, I found that they were lined with

the long columnar epithelial cells so often described in works on ovarian pathology. There were numerous chalice or goblet cells, and diverticula of epithelium projected freely into the surrounding connective tissue. That new cysts may be formed by the coalescence of the free ends of papillary processes of epithelium, as Wilson Fox and others believe, I do not deny, but in this, and in other sections that I examined, I found more certain evidence that some cysts were formed by the closing in of the upper part of epithelial ingrowths, which burrow deeply into the subjacent connective tissue.

Some of the cavities in this section were very minute. One of them $\frac{1}{20}$ inch in diameter (fig. 3, 1 *a*) appeared, under an inch objective, like one of the patches of colloid change described by many authors (fig. 3, 2). On examining the same

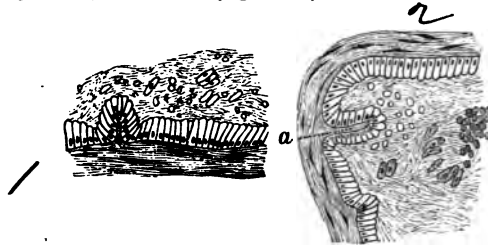


FIG. 4.—1. The epithelial lining of one of the large cavities in Fig. 3, 1, with broken-down cells lying free above it.
2. A portion of 2, Fig. 3, showing a distinct epithelial lining and collections of cast epithelium, seen in their long and short diameters. At *a* is an epithelial ingrowth, marked *a* in 2, Fig. 3. ($\frac{1}{8}$ inch objective.)

with an eighth-inch power, the entire cavity was found to be lined with the characteristic long cylindrical epithelial cells (fig. 4, 1). The cavity figured in fig. 3, 2 was bisected by an ingrowth of connective tissue, and in the lower segment the epithelial lining had become detached from the surrounding stroma. Under a one-inch objective, minute processes could be seen projecting into the contents of the cavity, especially at certain points (fig. 3, 2 *a*). The lower of these two indicated in the sketch appeared under an eighth-inch objective as in fig. 4, 2 *a*. In fact, it was an epithelial process. The contents, even under a low power, were not homogeneous in appearance. On careful examination the greater part appeared as a collection of broken-down epithelium. In fig. 4, 1 the translucent cast epithelial cells are represented above the free surface of

the intact epithelial lining of the cavity. In fig. 4, 2 I have drawn the same appearances as I found them; towards the right are about a dozen cells lying lengthwise, and not advanced in disintegration; close to them are a cluster of similar epithelial cells standing on end; these clusters made the dotted appearance observed under a lower power (fig. 3, 2). The greater part of the contents of the cavity appeared to be filled with cast epithelial cells. Whether the homogeneous substance between the cast cells represented a further stage of disintegration, or was a direct secretion from the intact epithelial lining of the cavity, I cannot say; the relation of epithelium to secretion is still, I believe, a disputed question among physiologists.

The appearances I have just described have been frequently taken for colloid changes in the stroma, but the epithelial lining shows that the cavities must have had some relation to the larger cysts with similar epithelial investments. I believe that they are developed from obstructed diverticula; the casting-off of epithelium and the free secretion into the interior of these cavities causing considerable distension. I have observed true colloid changes in the stroma in these glandular masses, but they were patches of a uniform semi-opaque material, with few or no processes of connective tissue traversing them, and without a trace of any epithelial lining.

In other specimens I found that the solid masses appeared as a meshwork of cavities representing cysts, and lined with columnar epithelial cells that were never ciliated. The scanty stroma was young connective tissue. I could not find any of the cavities simulating colloid change as in the section above described.

These solid growths, with innumerable cystic cavities in their substance, certainly appear to deserve the name of glandular growths or adenomata. That the stroma may be sarcomatous in some cases, I can myself testify; but, as a rule, it is merely young connective tissue without malignant characteristics. The term mucoid epithelioma is open to obvious objections; mucoid adenoma is far more reasonable a term. The long cylindrical cells lining the cysts within these growths differ very greatly from the germinal epithelium of a foetal ovary,

from the epithelial covering of the tunica albuginea in the adult, from the membrana granulosa of the follicles at any stage of their development, and from the epithelium of the traces of the Wolffian ducts in the hilum, extending occasionally to the parenchyma. Hence, if the formation of typical multilocular cysts be traced from any of the above structures, the pathologist must depend upon other elements than the epithelium for proof, or else admit that epithelium changes its character completely according to circumstances. This is exceedingly probable, and, in another chapter, I have given my reasons for believing that changes in undeveloped Graafian follicles arrested in their processes of atrophy are the starting-points of multilocular ovarian cysts. According to the researches of Mr. F. S. Eve, to which I have referred at the conclusion of that chapter, it is easy to connect the primitive extension of follicular epithelium with the more minute cavities which I have just described, if only we could be sure that when the former, about $\frac{1}{100}$ inch in diameter, are in course of development, their epithelium gradually alters till it becomes as in the latter, which are about $\frac{1}{20}$ inch in diameter. This is possible, but not proven.

The question of diagnosis is very familiar to the readers of modern surgical literature, but I will conclude this chapter with a few observations on the subject. To ensure the greatest possible accuracy in diagnosis of a suspected ovarian tumour, several small points must be borne in mind. The patient should of course lie on her back during examination, with the planes of her shoulders and hips parallel with the plane of the couch. The chamber in which she is examined should be warm, and not adjacent to a noisy street, or to a room full of people engaged in conversation. A draught causes real danger to the patient; cold is the source of, not only discomfort, but also great physical irritability, impeding diagnostic manipulations; noise is disturbing to the surgeon, and a grave impediment when pregnancy is suspected, as in such a case auscultation must be practised in order to find out if the foetal heart-sounds be audible, and perfect silence is then essentially requisite. The surgeon should be particularly careful that his hands are warm. Cold fingers cause contractions of the patient's abdo-

minal muscles, greatly interfering with diagnosis; they do not, moreover, possess their most perfect degree of tactile sensibility until they are comfortably warm. Tight-fitting gloves, when worn in winter, make the fingers very numb as well as cold; they should, therefore, be taken off at least ten minutes before the patient is examined. To restore warmth to the hands, the natural temperature of the pockets generally proves more rapidly efficacious than immersion in hot water, but the simplest and best method is to wait for ten minutes before beginning the necessary manipulations in a warm room, for the hands warmed by the general rise of the circulation will part with their heat less rapidly than if merely warmed locally.

Inspection, palpation, percussion, and auscultation must be carried out on the principles necessary for the diagnosis of any abdominal tumour. The dress of the patient should be so arranged as in no way to touch or compress any part of the abdomen. Stays only half unlaced and pressing on the epigastrium, or the upper edge of a skirt or petticoat constricting the hips, are most effectual impediments to examination. When from the absence of bulging and dulness on percussion in the flanks, of resonance in the umbilical region, of altered area of dulness on turning the patient on her side, and of certain signs of visceral disease, it is evident that ascites does not exist, or when there is reason to believe that there is more or less free fluid in the peritoneal cavity, then the surgeon must see if a circumscribed tumour can also be detected. The prominence of the front of the abdomen and the great increase of distance between the umbilicus and the pubes are very characteristic in cases of large ovarian and uterine tumours. A distinct thrill on percussion is very marked in cases of true parovarian cysts in thin patients, or in thin-walled ovarian cysts where one cavity greatly exceeds the others in capacity. In such cases fluctuation is of course evident. On the other hand, when the cyst is multilocular, the contents very colloid, or the abdominal walls thick, fluctuation is often very difficult to detect. Even after a fair amount of experience, the surgeon cannot always feel certain that a somewhat firm and very obscurely fluctuating tumour is a multilocular ovarian cyst, and not a soft sarcoma of the ovary, or a soft uterine outgrowth. If the pedicle be short

or the outgrowth pedunculated, even the sound will fail to distinguish between uterine and ovarian tumours.

The diagnosis of adhesions between the cyst wall and the abdominal parietes will always be attempted by the surgeon, but in these days adhesions of this kind are little dreaded, and, if suspected, must not of themselves be made a bar to operation. The sliding of the abdominal walls over a cyst that is not adherent is very characteristic, especially when the cyst wall is irregular. But when the cyst is very large, tightly stretching the abdominal walls, this movement is often imperceptible. Sir Spencer Wells has already shown how bands of adhesion may be stretched when soft, so as to allow free sliding of the abdominal walls during the respiratory movements. I have seen several instances of this condition, and, on the other hand, I once examined, together with several colleagues, a woman, aged fifty, where a cyst, not very bulky, appeared to be fixed to the abdominal walls, but not a single parietal adhesion was found when the operation was performed, contrary to the expectation of all who had examined the case.

Some words must be said on crepitus detected on palpation. When an ovarian cyst attains large proportions the parietal peritoneum and the omentum are very liable to repeated attacks of inflammation. The patient complains of abdominal pain and tenderness on pressure, often trifling in proportion to the extent of peritoneum involved. The temperature rises, and on placing the hand upon the abdomen, over the cyst, very distinct crepitus can be detected. This is a physical sign of the friction between two inflamed surfaces, and of necessity implies that adhesions do not exist, at least over the area of crepitus. If the general symptoms be not severe, it is most probable that the cyst wall is not involved in the inflammatory process, or at the most only to a limited extent. It must not be forgotten that where crepitus is detected there is presumptive evidence that the inflammatory process may be existent in a more advanced stage behind the cyst, which may have strong visceral and pelvic adhesions. Still more important is it for the surgeon to remember that when crepitus is evident on palpation, it is in his power to check a serious morbid process, and to diminish the risks and

difficulties of a future operation. Absolute rest in bed must be enforced on the patient, and the application of large poultices to the abdomen will prove of great benefit; if this be done there need not be much necessity for preventing the action of the bowels for several days, unless the general symptoms be very severe, for it is after prolonged constipation that the condition in question frequently occurs. In two cases in my own practice where crackling could be felt over the entire surface of the tumour and troublesome costiveness existed, this treatment proved of marked benefit; at the operation that succeeded traces of peritoneal inflammation were evident, but no adhesions were found. In one of these cases there had been a distinct rigor and a rise of temperature to 101.4° , following the introduction of the uterine sound. The operation was performed three weeks later; no suppurative processes existed. In both cases recovery was rapid.

When a cicatrix of a tapping puncture is seen, it is probable that the cyst wall adheres to the abdominal parietes at that point, but the adhesion is not generally very intimate. This question concerns the subject of tapping more than diagnosis. If the cyst has been frequently tapped with an ordinary trocar, without an aspirator, or without antiseptic precautions, the surgeon may reasonably suspect adhesions, not alone through the repetition of the palliative measure, but also from the conditions that rendered that measure needful and that imply the existence of adhesions.

After, or rather in the course of examination of the abdomen, pelvic exploration must be undertaken. It is very important that the bowels should have first been well cleared, if the patient be examined by appointment, and if she present herself, unsuspecting the nature of her complaint, to the surgeon, he must be very certain that the middle and upper part of the rectum be not loaded with scybala. A few faecal masses near the anus are readily distinguished; they pit when pressed upon by the finger applied to the posterior wall of the vagina. But when hard scybala are collected in the bowel at the level of the cervix and body of the uterus they greatly impede diagnosis. They are often too firm to pit upon pressure, any attempt at which causes tenderness, as it is hard to press on

structures high up in the pelvis without the nail touching the vaginal mucous membrane. They here simulate fibroid outgrowths from the back of the uterus, especially when pressed downwards and backwards by the cyst and the uterine body; they also prevent the surgeon from properly estimating the existence or extent of solid deposits in the pelvis.

The above observations refer especially to the common multilocular cyst. The other forms of cystic disease of the uterine appendages are as a rule less easily recognised, but some of their clinical features will be considered in other chapters, together with further details of clinical interest in relation to multilocular cysts, especially with regard to adhesions, rupture, and the management of the pedicle.

CHAPTER III.

*THE PAROVARIIUM AND ITS RELATION TO CYSTIC DISEASE
OF THE BROAD LIGAMENT—SIMPLE BROAD LIGAMENT
CYSTS.*

IN the preceding chapters I have limited my observations almost entirely to questions bearing on the development and structure of multilocular ovarian cysts, including those that bear glandular or adenomatous contents, but excluding papillomatous cysts, nor have I yet dwelt on the subject of sessile ovarian tumours. For reasons which will be apparent on perusal of this chapter, it is advisable to consider the histology and pathology of the structures included within the folds of the broad ligament before entering into the pathology and clinical features of sessile and papillomatous cysts of the ovary. Just as Pflüger's tubes have been a stumbling-block in the way of a correct appreciation of the development of the multilocular cyst, so the parovarium is a centre round which much error has revolved. Only it is, unlike Pflüger's tubes, a real structure and not a misleading term for an appearance seen in microscopic sections. Owing to its somewhat mysterious character, much in the way of cyst development has been attributed to it, but the most frequent form of broad ligament cyst is at least not invariably of parovarian origin, whilst another and more serious kind of cystic tumour decidedly develops, in some cases, from the parovarium, whilst in others it as surely springs from the hilum of the ovary.

As the parovarium plays such a prominent part in the pathology of cystic tumours of the broad ligament, it is better that the organ itself be considered before discussing the origin of minute cysts in its vicinity. Implicit trust must not be placed in diagrams and second-hand information, as sources of

knowledge of the anatomy of this structure. It is not sufficient for us to think of the parovarium as something also termed the organ of Rosenmüller or epioophoron; some obscure, insignificant structure beautifully figured in two or three foreign works on anatomy. It is equally unscientific to despise it as a 'relic.' Every part of the human body is a relic of what once was embryonic; most organs develop, it is true, and increase in functional importance, whilst the parovarium does not normally develop in the adult, and though it may have its functions, they are as yet unknown. It seems strange that so definite a structure should persist into adult life, and yet be good for nothing. The blocking of its efferent duct and the incomplete character of the epithelial lining of its tubes certainly make it appear to be as useless as the nipples of the male. To the pathologist the parovarium is of great interest, since, from or near it, cysts of the simplest and of the most complicated type may take their origin, and undoubtedly some such cysts actually arise from it, whilst others are merely associated with it by accidental proximity. To procure a good pair of uterine appendages suitable for the dissection of the parovarium, it is best to remove the internal organs of a young adult virgin who has not suffered during life from any disease of the pelvic viscera that tends to cause thickening of the broad ligament or longstanding congestion of its vessels. A still more suitable opportunity for examining the parovarium occurs when a multilocular glandular (and not papillary) cyst of the ovary is removed, provided that the operation be uncomplicated; then, if no local inflammatory processes have existed, the broad ligament will be found lying, with the Fallopian tube, upon the cyst, thin and very much stretched. The parovarium may then be plainly detected on holding the tube and the ligament up to the light. If, however, the specimen be preserved in spirit, the tissues of the ligament become semi-opaque and obscure the view of this structure. It is necessary, therefore, to dissect off the posterior layer of the broad ligament when the specimen is fresh. This can be readily effected if the tube and ligament, with a small portion of ovarian tissue, be pinned on a flat piece of cork and immersed in a saucer filled with water. When the entire outline of the parovarium is exposed, methylated spirit

must be added ; in a few hours the tubes of that structure will be sufficiently tough for further dissection. When freed from its attachment to the posterior layer of broad ligament, its tubes shrink up, but it can be readily stretched and fixed to adjacent structures by means of silk threads, so as to show far better than before dissection. Fig. 5 represents, diagrammatically, the parovarium and other structures in its vicinity, to which frequent reference will be made throughout this chapter.

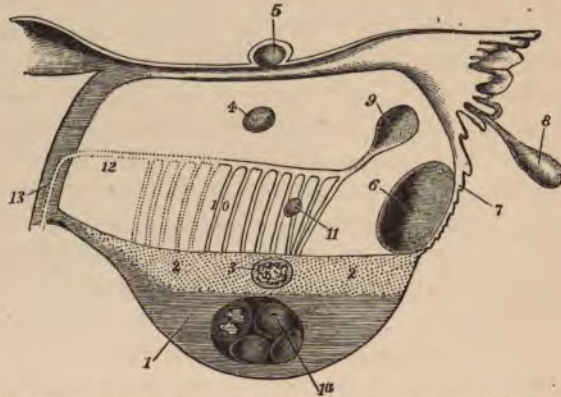


FIG. 5.—DIAGRAM OF THE STRUCTURES IN AND ADJACENT TO THE BROAD LIGAMENT.

1. Framework of the parenchyma of the ovary, seat of 1a, simple or glandular multi-locular cyst. 2. Tissue of hilum, with 3, papillomatous cyst. 4. Broad ligament cyst, independent of parovarium and Fallopian tube. 5. A similar cyst in broad ligament above the tube, but not connected with it. 6. A similar cyst developed close to 7, ovarian fimbria of tube. 8. The hydatid of Morgagni. 9. Cyst developed from horizontal tube of parovarium. Cysts 4, 5, 6, 8 and 9, are always lined internally with a simple layer of endothelium. 10. The parovarium; the dotted lines represent the inner portion, always more or less obsolete in the adult. 11. A small cyst developed from a vertical tube; cysts that have this origin, or that spring from the obsolete portion, have a lining of cubical or ciliated epithelium, and tend to develop papillomatous growths, as do cysts in 2, tissue of the hilum. 12. The duct of Gartner, often persistent in the adult as a fibrous cord. 13. Track of that duct in the uterine wall; unobliterated portions are, according to Coblenz, the origin of papillomatous cysts in the uterus.

The vertical tubes of the parovarium and the horizontal canal into which they run, superiorly, are easy to recognise. If one of these tubes be prepared for the microscope it is most probable that, though patent, nothing will be found within it excepting broken-down epithelium, and, perhaps, small tracts of the inner wall still lined with cubical epithelial cells. The canal or efferent duct can often be traced inwards till it becomes a slender band that runs in the direction of the uterus (fig. 6). This band is the duct of Gartner, more persistent in many of

the lower mammalia than in woman. I have found it well-marked in over a fifth of the specimens that I have examined.



FIG. 6.—LEFT BROAD LIGAMENT. Its posterior layer has been removed. Parovarium well formed. Duct of Gartner distinct; the horizontal tube has sunk downwards in process of dissection, so that the duct appears to run upwards as well as inwards. A cyst is developed from one vertical tube. A large pyriform cyst is continuous, by a thin cord, with the horizontal duct.

For several years, the attention of anatomists and surgeons has been frequently directed to a pair of ducts situated one on each side of the female urethra. They appear to be almost, if not quite constant, and, morphologically speaking, they were hailed on their discovery as positive proofs of the persistence of the inferior portion of the efferent duct of the Wolffian body in woman. Coblenz and other writers have traced Gartner's ducts in woman and in domestic animals, from the parovarium to the walls of the urethra; Kocks, Kleinwächter, and especially Skene of Brooklyn, all describe the ducts found in the urethra of the human female. The urethral ducts, or 'Skene's tubes,' appear to be subject to a localised catarrhal inflammation. Böhn, of Vienna, and several French surgeons have described this affection, and recommend the introduction of a probe coated with nitrate of silver when the discharge becomes chronic, the ducts being laid open if that treatment fail. Rieder, of Basel, has failed to trace Gartner's ducts as far as the urethra, and recently Dr. Max Schüller, of Berlin, has published the results of a long series of dissections, and his conclusions tend to subvert the theories of Skene and the morphologists, the urethral

ducts appearing to be the outlets of a pair of very distinct glands. Dr. Schüller states that, between the longitudinal folds of urethral mucous membrane that converge towards the meatus, numerous pores and depressions may be found. On each side of the middle line, posteriorly, rises a ring of mucous membrane surrounding an orifice, into which a sound of from one to four millimètres in thickness can be passed for from half a centimètre to two and a half centimètres upwards. This is the duct, and the pair have been found by Dr. Schüller in subjects of every age, from foetal life to the eightieth year, almost constantly. Inflammation of the urethral ducts can be diagnosed, he believes, when discharge from the meatus exists, without scalding pains during micturition. On horizontal section each duct appears as a tube, with a contour the more and more irregular from involutions and elevations of its lining membrane the higher up the section is made, until it can be traced to its termination above as a gland made up of a collection of short tubules. The orifice of the duct is lined with a thick layer of squamous epithelium covering erectile tissue; the rest of the canal is invested with stratified transitional epithelium, covering vascular submucous tissue that contains plain muscular fibres. In old subjects the ducts are much contracted. Dr. Schüller has traced their origin in the foetus to the same period of embryonic life as that wherein the other structures composing the urethral mucous membrane are developed, and he can find no communication between them and the duct of Gartner. I have observed a catarrhal discharge from these ducts in two of my out-patients at the Samaritan Hospital. As for Dr. Schüller's discovery, it is possible that the gland forms a secondary communication with Gartner's duct very early in foetal life; this would reconcile the above conflicting theories.

The lower ends of the vertical tubes of the parovarium are lost in the hilum of the ovary; this is a matter of great pathological importance, as will presently be explained. The innermost of the tubes are always more or less obliterated as a rule; about eight or ten are well developed, whilst five or six more remain visible as fibrous threads. When cystic ovarian disease exists, the tubes are always more distinct than in health, and in cases of double cystic disease I have generally found them best

marked on the side where the largest tumour has developed. In one such parovarium I counted twenty-four well-developed vertical tubes. In all probability the inner tubes are the seat of origin of those papillary cysts that are sometimes found between the less obliterated part of the parovarium and the uterus. In the normal parovarium the vertical tubes are not parallel to each other, as they converge inferiorly. When a tumour of the ovary exists this is less marked, as the hilum has increased in size and spread out the lower ends of the tubes. Each tube runs a somewhat zigzag course downwards.

In most specimens several small cysts may be found in different parts of the broad ligament and its vicinity. The long pedunculated hydatid of Morgagni (fig. 7) is an almost constant pear-shaped cyst hanging from one of the lower fimbriæ of the Fallopian tube; it represents the blind extremity of Müller's duct, which, in the process of development, breaks open near that extremity, and develops the fimbriæ along the border of

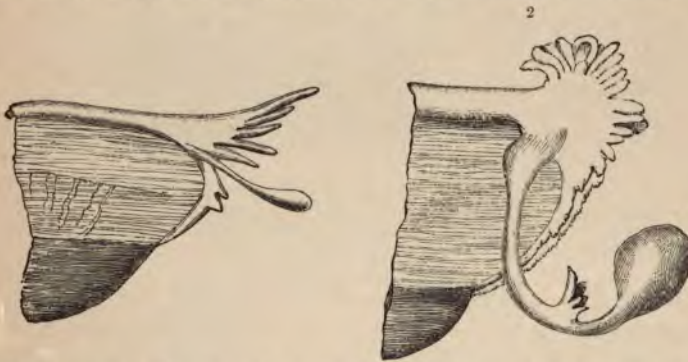


FIG. 7.—A SMALL HYDATID OF MORGAGNI (viewed anteriorly); it arises above and in front of the ovarian fimbria. The fimbriæ of the Fallopian tube are ill developed.
2. An unusually well-developed hydatid of Morgagni (viewed anteriorly). The hydatid arises from the same point as in the upper figure. The fimbriæ of the Fallopian tube are highly developed, but short.

the line of dehiscence. The term 'hydatid of Morgagni' is exclusively employed by some anatomists to signify the pedunculated cyst found in connection with the testicle; this cyst is likewise believed to be a vestigial relic of the uppermost extremity of Müller's duct, the lower portion of which is represented in the adult male by the tissue round the sinus pocularis in the prostatic part of the urethra. The use of the name

'hydatid of Morgagni' for homologous bodies in both sexes is to be encouraged, being scientifically correct. This hydatid is certainly not identical with the sessile cyst frequently developed behind the long or ovarian fimbria of the Fallopian tube. I have repeatedly found the cyst and the hydatid co-existent. The pedicle of the hydatid is above and anterior to the root of the ovarian fimbria.

At the outer extremity of the horizontal tube or efferent duct of the parovarium a very similar cystic body, also pedunculated, is frequently developed (figs. 6 and 8). I have found every cyst of this kind to be lined with an inner layer of endothelium, and not with the ciliated or columnar epithelial cells which invest the lining membrane of a vertical tube. This



FIG. 8.—A PEDUNCULATED CYST, continuous with the horizontal tube of the parovarium. Above it is a cyst of similar form, independent both of the Fallopian tube and of the parovarium. Both cysts were lined with endothelium. The cut surface of the ovary displays two corpora lutea.

terminal cyst is occasionally non-pedunculated (fig. 9), forcing apart the layers of the broad ligament as it increases in size. As a rule, however, it hangs from the ligament by a pedicle. Since pedicles of this type are poorly supplied with blood, and readily become twisted, neither this terminal cyst, when pedunculated, nor the hydatid of Morgagni ever attain large dimensions.

On a vertical tube of the parovarium a minute cyst may often be found (fig. 6), and close to the point of entry of such a tube into the tissue of the hilum of the ovary a similar cyst may sometimes be detected, partly embedded in the ovarian tissue. Far away from the parovarian tubes some minute cysts are often observed, adherent, as a rule, to the anterior layer of

the broad ligament (figs. 10 and 12). They are most plainly visible anteriorly, through the ligament, when the specimen is fresh. When developed beneath the reflexion of the peritoneum



FIG. 9.—A SESSILE, THIN-WALLED CYST, developed on the extremity of the horizontal tube of the parovarium, viewed from behind. The outermost vertical tube passes in front of it. The cyst is quite independent of the ovarian fimbria of the Fallopian tube.

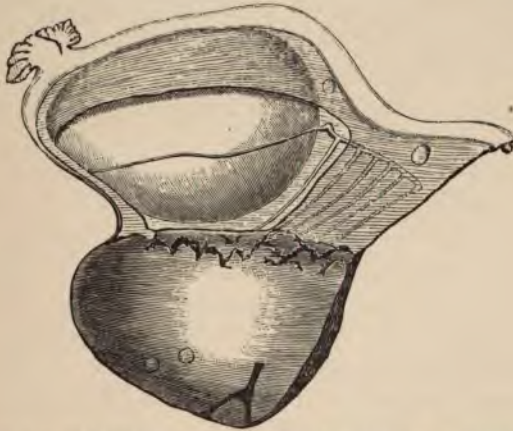


FIG. 10.—AN OVARY WITH THE TUBE AND INTERMEDIATE STRUCTURES.

A part of the posterior layer of the broad ligament has been removed. A large thin-walled cyst lies between the layers of that ligament; it is quite independent of the Fallopian tube and the parovarium. The outermost vertical tube of the parovarium crosses over the cyst and joins the ovarian fimbria, an unusual condition. Two smaller broad-ligament cysts lie internal to the large cyst.

over the upper border of the Fallopian tube, they are often pedunculated, as they can more readily push the serous membrane upwards than insinuate themselves between its layers below the

tube. Still, even in this position, the cyst may be perfectly sessile (fig. 11). In some cases these cysts become pedunculated, even when they are developed in the folds of the broad



FIG. 11.—A THIN-WALLED CYST, developed in the broad ligament at its line of reflexion over the Fallopian tube. The cyst is perfectly free from the tube.

ligament below the tube (fig. 8), and sometimes several such pedunculated cysts hang like tassels from the ligament. As a rule, however, these cysts, when they increase in size, push apart the layers of the broad ligament. I have invariably found that their inner layer is endothelial. It is often from a minute cyst of this kind, free from the parovarian tubes, that is developed the large cyst commonly termed 'parovarian,' with its thin transparent wall, its single cavity, lined with flat or low columnar epithelium, and its clear watery contents. I have examined over one hundred broad-ligament cysts of this kind, perfectly free from the parovarium and from the tube, and ranging from one-fortieth of an inch to one inch in diameter. The broad ligament is often studded with minute cysts, some spherical, some oval, and in rarer instances they assume an ovoid form, standing out from the surface of the broad ligament, without possessing a pedicle.

I have also observed a cystoid degeneration of the broad ligament apparently produced by local congestion or œdema. It is very frequently seen in cases of myoma of the uterus, where the tumour rises high in the abdomen and drags the ligaments upwards. When the tumour is cut away with the uterine appendages, the mass of small cyst-like projections disappear (for that reason I have made use of the term 'cystoid' degeneration), whilst generally a few true cysts can then be detected on the surface of the ligament. This condition is still

more frequent in the connective tissue around the ovarian vessels.

This so-called parovarian cyst often arises close to the ovary under the ovarian fimbria of the tube (figs. 10 and 12); as it develops it pushes the parovarium inwards, and rises, between the folds of the ligament, as high as the tube, which often becomes stretched to an indefinite extent. The true relation of the ovarian fimbria to the cyst will be considered further on. The entire parovarium may often be found outside the wall of such a cyst posteriorly (fig. 10). The terminal cyst of the parovarium, which also bears a layer of endothelium, may, as I have already observed, likewise become enlarged without developing a pedicle. It then forces the layers of the broad ligament apart, and becomes a large unilocular cyst that is truly parovarian. As it enlarges, it first comes in contact with the ovarian fimbria of the tube, which it stretches, and finally stretches the tube itself. In this stage it cannot be distinguished, either by its appearance and relations, or by the character of its endothelial lining, from a cyst originating in the manner just described, although when incipient the difference is apparent at a glance (figs. 9 and 12). Hence it is better to use the term 'simple cyst of the broad ligament' than to employ the term 'parovarian cyst' when speaking of a large cyst free from the ovary, which has generally been considered to be invariably of parovarian origin.

I will now take into further consideration the cysts in connection with the vertical tubes of the parovarium. These tubes, when perfectly developed and not degenerate, are lined with ciliated epithelium, as are the walls of certain cysts in the ovary and the broad ligament. Such cysts have a tendency to develop solid papillary growths from their inner walls, and usually contain a clear watery fluid; when they have grown to a large volume the epithelium generally ceases to be ciliated. Histologically and pathologically they are identical with the papillary cysts described elsewhere that appear in the tissue of the hilum of the ovary where relics of the Wolffian body exist, and do not tend to invade the stroma of the parenchyma, but rapidly grow into the broad ligament, forcing apart its layers.

I shall presently refer to the question of mixed papillary

and glandular cysts in ovarian tumours. As Wolffian elements extend into the tissue of the parenchyma of the ovary, and, on the other hand, follicles may grow into the tissue of the hilum, these mixed growths are readily accounted for. I have found that even the typical glandular ovarian cysts may, in rare cases, push into the hilum, and force apart the layers of the broad ligament. But histologically it is only the ovarian cysts with papillary contents that need consideration in discussing cysts that spring from the parovarium. No case of multilocular cystic disease of the broad ligament, with glandular intracystic growths and no implication of the ovary, has ever been described, but large papillary cysts of the broad ligament, entirely free from the ovary, which remains healthy, yet presenting all the characters of similar ovarian cysts, are now well known to pathologists. Incipient cysts of this kind may be seen in some specimens springing from a vertical tube of the parovarium. From the generally obliterated, inner vertical tubes of the parovarium, of which a faint indication may sometimes be found on dissection, similar cysts may develop between the parovarium and the uterus, as has already been observed.

These cysts with papillary contents spread over the broad ligament with great rapidity. If once a cyst wall bursts, papillary masses sprout freely into the peritoneal cavity and soon grow over the tube, the fundus uteri, and the visceral and parietal peritoneum. In the chapter on the Fallopian tube, I have given my reasons for believing that the masses of papillomatous growths that sometimes infest the ovary and broad ligament, and are unaccompanied by any cystic growth, may have their origin in the Fallopian tube itself. I have found perfect cysts, filled with the characteristic growth, on the peritoneum of Douglas's pouch, far from ovarian or parovarian tissue, in cases of ruptured papillary cyst of the broad ligament. It is, from this fact, easy to understand how similar papillary cysts may also be found between the layers of the broad ligament, on the site of the above-described minute cysts of non-parovarian origin; but whether, in such cases, these minute cysts themselves receive some morbid stimulus which causes their unperforated lining membrane to produce papillary growths, I cannot say, only I doubt this possibility. In mixed

glandular and papillary multilocular tumours of the ovary, each locus generally produces one of the two forms of solid growth alone, excepting when a papillary mass perforates a compartment loaded with purely glandular growths.

These papillary cysts of the broad ligament are, after all, not very common, whilst the small cysts, bulging from the vertical tubes of the parovarium, are far from rare. This is not to be wondered at, for the chance of any one such minute cyst ever growing large is very slight. The parovarian tubes, and everything associated with them, tend to atrophy and not to enlarge; it is unusual to find one single tube thoroughly patent in an adult, and its lumen is always more or less choked with broken-down epithelium. The cavities of cysts directly connected with the tubes generally become filled with a similar material, and all growth ceases, as a rule, before such cysts attain the size of a pea.

It is the presence of papillary growths, springing from the inner walls, that is the essential feature of cysts derived from the vertical tubes of the parovarium and their prolongation into the tissue of the ovarian hilum. Too much importance must not be placed on the presence or absence of ciliated epithelium. Dr. Fischel, in a paper 'Ueber Parovarialcysten und parovarielle Kystome,' in the fifteenth volume of the 'Archiv für Gynaekologie,' discusses this epithelial question at great length. He admits that on the inner walls of many of these cysts with papillary growths, ciliated cells are absent, or only found in places, and is diffident with regard to Klebs's opinion that the ciliated epithelium may become changed into other forms, nor does he fully accept Spiegelberg's theory that the pressure of the fluid contents can flatten ciliated epithelium till it loses its cilia and becomes pavement epithelium. Dr. Fischel is more inclined to believe that when ciliated epithelium is not found under these circumstances, the simpler type that replaces it was never ciliated at all. Waldeyer has shown that the epithelium of the Wolffian body is not originally ciliated; the simpler non-ciliated, cubical epithelial cells covering the papillæ in these cysts represent this earlier type of Wolffian epithelium. On the other hand, it must be clearly understood that the inner lining of all the other cysts described

above is endothelial—that is, made up of a single layer of flattened epithelial cells; this I have repeatedly verified by nitrate of silver staining. The usual condition of a vertical tube of the adult parovarium renders microscopic examination of its epithelium very difficult, but I have far oftener found simple columnar or cubical cells than ciliated epithelium. For the reasons just given, I believe it to be better to trust to the anatomical position of cysts of the broad ligament, as seen by the naked eye in their earliest visible stage, rather than to any blind reliance on the presence or absence of a kind of epithelium not always found in the very structure on which the whole question depends.

It might be contended that some of the minute non-parovarian cysts are developed from Müller's duct, which ultimately becomes the Fallopian tube. There is no evidence, however, that any true Fallopian cyst has ever been found, excepting such as are developed within its canal from obstruction, papillary growths, or extra-uterine gestation. The minute cysts found on the upper border of the tube, under the serous membrane, are, as has already been observed, quite free from the tube and identical in character with the non-parovarian broad-ligament cysts found below the tube. The cyst, often developed between the layers of the broad ligament close to the ovarian fimbria of the tube, does not appear to be histologically continuous with it. It is lined with endothelium, whilst the ovarian fimbria is invested with a layer of ciliated epithelium. This is not, perhaps, conclusive evidence, as the same applies to the hydatid of Morgagni. On examination of a cyst of this kind, however, I have ever found that the fimbria was distinct from it; the subdivisions of its fleshy processes being stretched over the capsule of the cyst, just as the entire Fallopian tube is stretched over a larger cyst (fig. 12). The small shreds or tags that often project from the upper border of the tube, and are covered with a layer of serous membrane, are not cysts but abnormal fimbriæ. They are the result of an exaggeration of the process of dehiscence which normally takes place near the extremity of Müller's duct, when the orifice of the tube and its fimbriæ are developed. If the split be prolonged backwards, a fringe may be formed some distance behind the normal fimbriæ.

But a cyst could hardly be developed in the course of this process, excepting the hydatid of Morgagni, which is almost constant, as the dehiscence never extends to the extremity of

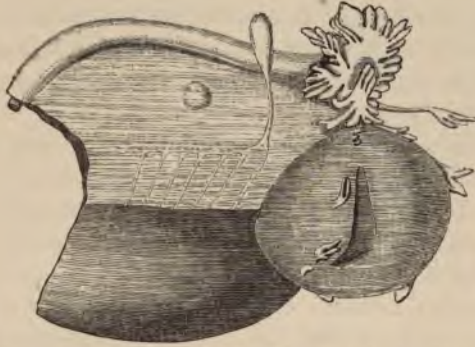


FIG. 12.—A RIGHT BROAD LIGAMENT showing a large cyst developed between its layers close under the ovarian fimbria of the Fallopian tube; the secondary fringes of that fimbria are stretched over the cyst and parted widely from each other, and an incision in the capsule exposes the cyst-wall. The horizontal tube of the parovarium terminates in a pedunculated cyst. A small cyst is developed in the broad ligament above the parovarium. The hydatid of Morgagni is replaced by a pedunculated fringe.

Müller's duct, and that extremity always tends to close at the point of dehiscence, so as to become at once a cyst hanging from the fimbriæ, the hydatid of Morgagni itself. The pedicle may be very long, or may be replaced by a small fringe mounted on a long pedicle, or may even bear a second fimbria, as a singular specimen that I once examined (fig. 7). It often undergoes hypertrophy and elongation in cases of cystic disease of adjacent structures, or when chronic inflammation of the tube and ovary has existed for a prolonged period. In one case of long-standing suppuration of an ovarian cyst treated by excision, I found, when the entire cyst was ultimately removed, that the pedicle of the hydatid was six inches long, although the hydatid itself was not a quarter of an inch in diameter; the case will be described in the chapter on the abdominal wound in ovariectomy.

I will first consider the simple broad ligament cyst more specially, before turning to papillomatous and sessile cysts in connection with the ovary, parovarium, and broad ligament. In its more clinical aspects the simple broad ligament cyst has been for long familiar to the surgeon. In the earlier success-

ful cases of 'ovariotomy' it was, at least as a rule, a cyst of this kind that was removed; this subject has been discussed by Mr. Tait. The diagnosis of a broad ligament cyst is generally easy; adhesions are rare, and the results after operation very satisfactory; the operation itself is seldom difficult, although one complication may tax the skill of the operator to the utmost. The beginner naturally prefers to commence with a case of broad ligament cyst. It is significant that, at the Samaritan Free Hospital, this kind of cyst is not often seen, although a few years back it was very frequently removed by operation at that institution. Many such cysts are now operated upon by private practitioners with excellent results. By a process of selection, easy to understand, it is the worst cases of ovarian tumour, or rather those that from external appearance promise to be the worst, that are most frequently sent to special hospitals.

The thin wall of a broad ligament cyst, with the tube tightly stretched over it, and the clear, watery contents are well known to surgeons and pathologists. Some good drawings

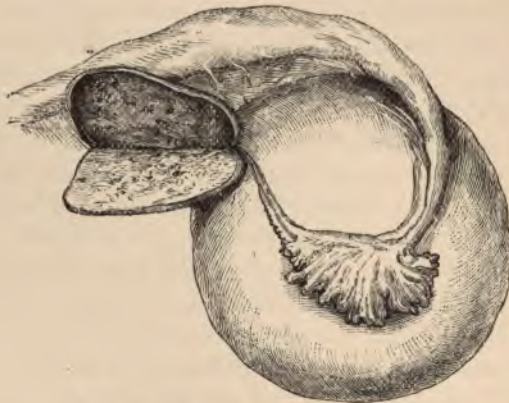


FIG. 13.—A SIMPLE BROAD LIGAMENT CYST.

of fully developed 'parovarian' cysts are to be found in a paper by Dr. Bantock in the fifteenth volume of the 'Transactions' of the Obstetrical Society of London. The ovary generally hangs free and unaffected from the lower part of the cyst (fig. 13).

In six cases that I have seen, that organ, on the other hand, was stretched out and flattened, by the extreme size and tenseness of the cyst, which jammed it down into Douglas's pouch or stretched it out, as the capsule became more and more distended, much as the Fallopian fimbriæ are stretched, although from the relation of the ligament to the ovary that organ cannot be brought so close into contact with the cyst as can the tube which lies within the folds of the broad ligament. In one case, under the care of Mr. Meredith, the flattening of the ovary was so extreme that it was difficult to find it at all, until some Graafian follicles were discovered on cutting into a thickened area on the capsule. The ovarian ligament is also frequently stretched to the extent of three or four inches.

It is not common to find papillomatous growths springing from the inner walls of a tumour that in all other respects bears the appearances of a simple broad ligament cyst, but when they are found this offers the strongest possible evidence that the cyst is truly parovarian, for reasons which I have already given at length. In one case, that died of tetanus, I found a small bunch of papillomatous outgrowths, the ovary was not the least compressed, but the growth of the cyst had been arrested by twisting of its pedicle, and hæmorrhage had occurred into the cyst cavity, causing its contents to be very turbid. Had this complication not occurred, the papillary growths would probably have been more exuberant. In another case I found half-a-dozen such outgrowths; the cyst was of the usual type with very clear fluid contents.

The possibility of the existence of papillomatous outgrowths appears to me to be a strong argument against attempting the cure of broad ligament cysts by simple tapping. This often proves to be a permanent remedy, and is, I understand, still advocated by that most distinguished surgeon Dr. Keith. But the removal of a simple broad ligament cyst is a very easy operation, and the mortality exceedingly low; at the best it appears hardly advisable to leave a large flaccid cyst hanging down into the pelvis, and should there be any papillary growths it is very unsafe to leave them behind, as they may suddenly increase with great rapidity, and invade the peritoneum. Tap-

ping is also not unfrequently very inefficacious ; in one instance, a case under the care of Dr. Bantock, the cyst had been tapped seven times. At the operation a few adhesions, rare in cysts of this type, were found. The ovary was much flattened out, so that the cyst must have become very tense and grown rapidly notwithstanding the tapplings.

Rupture of a simple broad-ligament cyst is not rare ; I have seen two operations where this had previously occurred. In one it had been caused by a fall, in the second it had taken place several years before operation, and a large cicatrix was found in the cyst wall. On account of the nature of the fluid contents, this accident very seldom produces severe peritoneal symptoms. In the two above referred to, the rupture had caused very little inconvenience to the patient.

When the abdominal incision, including the division of the peritoneum, is completed, the thin wall of a broad ligament cyst generally presents a very characteristic appearance, differing greatly from the shiny, more or less opaque, silvery-white surface of a true ovarian cyst. In one case, under Mr. Thornton's care, the walls of an undoubted broad ligament cyst were much thickened by a great development of fibrous tissue, so as to present the appearance of a thin-walled ovarian cyst.

Inflammation of the cyst-wall is uncommon ; I have only observed one case where this condition was marked ; the operation was perfectly simple. On account of the little tendency which these cysts possess to cause peritoneal irritation, adhesions are rare. One case is mentioned above, and was clearly the result of tapping. In another case, where I assisted Sir Spencer Wells, the sigmoid flexure was closely adherent to the capsule, but its separation was not difficult. In a third case, under the care of Mr. Meredith, there were deep pelvic adhesions, greatly prolonging the operation. In a fourth, in Mr. Thornton's wards, the adhesions were very troublesome, and the temperature rose to 102° on the second and third day.

The only troublesome complication that is frequent in operations on broad ligament cysts arises from the disposition

of the capsule in some cases. As a rule, the cyst pushes against the tube, the ovarian fimbria, and the ovary, and a good pedicle separates it from the uterus. But in some cases it burrows downwards so as to grow in the direction of the ovarian ligament, and beyond the limits of the broad ligament, and its removal becomes a matter of considerable difficulty. It is then necessary to shell the cyst out of the ligament, which has afterwards to be, for the greater part, cut away, a portion being treated as a pedicle, and secured by ligature. Exclusive of over fifty cases where incipient broad-ligament cysts were found in connection with ovarian and uterine tumours, I have assisted at thirty-two cases where fully developed broad-ligament cysts were removed, and in six the process of forcible separation of the broad ligament was requisite in order to get at the deepest part of the cyst. In one case, under Dr. Bantock's care, the cyst burrowed deeply into Douglas's pouch, whence it was shelled out. In another case, under the same surgeon, the process of detachment of the capsule was easier, though the cyst was very large, forming a tumour that extended into both flanks; the ovary was so much flattened as to be hard to recognise, and the tube stretched in a singular manner, its ostium being widely dilated, so that when the elongated fimbriæ were held up, it was possible to distend the tube by simply blowing at the ostium, without the aid of a blow-pipe.

In both the cases of rupture, above described, the cyst had to be shelled out of its capsule. In another case a large broad ligament cyst existed on both sides, the wall of the right-hand cyst seemed to have become inflamed, the fimbriæ of the tube were matted together. The detachment of the capsule proved to be a very difficult task; a drainage tube was passed into Douglas's pouch, but the patient died on the fourth day.

As a rule, recovery is very rapid and without any considerable rise of temperature; in one case, however, that I have seen (a woman of thirty-six years of age), the temperature rose to over 105°, though complete antiseptic precautions had been taken, but the patient had been subject to ague; she recovered perfectly.

In one case the right broad ligament was cystic, whilst the left ovary was converted into a multilocular cyst. In another two cysts existed on one side, one holding several pints, and the other about an ounce of characteristic clear fluid. This specimen, removed by Mr. Thornton, forms a very instructive preparation, now in the Museum of the College of Surgeons (Pathological Series, 4588, new catalogue). The relation of the cysts to the broad ligament is illustrated by dissection.

CHAPTER IV.

*PAPILLOMATOUS AND SESSILE OVARIAN CYSTS—PAPILLO-
MATOUS DISEASE OF THE BROAD LIGAMENT.*

As papillomatous cystic disease of the uterine appendages, excluding the Fallopian tube, which will be considered further on, appears to be very intimately associated with the relics of the Wolffian body, which are represented in the adult chiefly by the parovarium, the reason why I have entered into the subject of parovarian cysts before turning to papillomatous cysts of the ovary will now be evident. For the elimination of certain errors, I have been compelled to state at length all that I had to say concerning broad ligament cysts in general before returning to the remaining forms of cystic ovarian disease.

The ovary is divided into two parts, histologically distinct, and differing in the manner of their development. The essential part is the collection of Graafian follicles, or parenchyma, with its surrounding stroma, and the other part is the tissue of the hilum, close to the broad ligament. From the stroma of the parenchyma (fig. 5, 1) arise the ovarian cysts already described. As the seat of origin of these cysts is in the free part of the ovary, they rapidly absorb the structures in that part, so that when the tumour is only a few inches in diameter, the normal outline of the ovary is lost, and its healthy portion cannot at first be detected (fig. 14). As the hilum remains as a rule free from disease, such cysts have usually a very distinct pedicle. In some cases, presently to be described, the common multilocular ovarian cyst, with or without glandular contents, is sessile.

From the tissue of the hilum of the ovary arise the multilocular proliferous cysts, which contain exuberant, firm papillomatous growths, instead of the succulent glandular material

found on the inner walls of many cysts arising from the stroma of the parenchyma. This tissue is very vascular, and contains, as

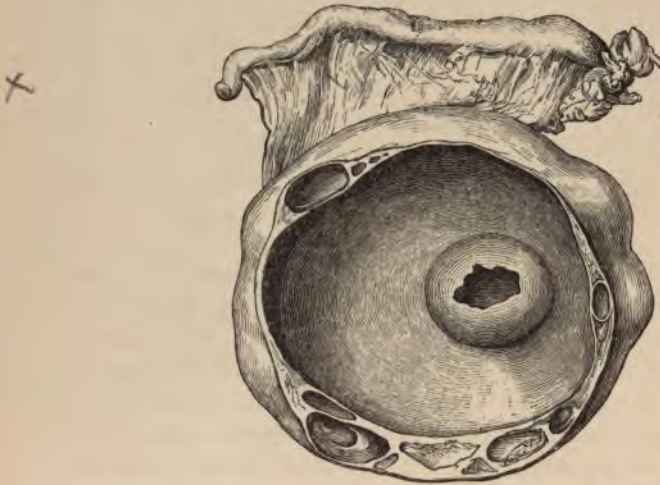


FIG. 14.—A SMALL MULTIOCLULAR OVARIAN CYST, slightly reduced from natural size (Museum of the Royal College of Surgeons, Pathological Series, No. 275).

has already been observed, traces of the tubes of the Wolffian body (fig. 1, 4). The parovarium, which represents the greater part of that body, appears to the naked eye to run into the hilum of the ovary. The papillomatous growths within these cysts are identical with similar growths found in certain large cysts of the broad ligament, the origin of which has been traced to relics of the Wolffian body lying between the parovarium and the uterus, as will presently be shown. As the seat of origin of these cysts is not in the free part of the ovary, the normal shape of that portion of the ovary is retained until the tumour has reached a considerable size. On the other hand, such tumours must almost always be more or less sessile, especially when, as is frequently the case, the layers of the broad ligament have been parted asunder by the growth, which tends to advance in that direction rather than towards the stroma of the parenchyma. The fluid within these cysts is clear and not glairy.

Since remnants of the epithelium of the Wolffian body ex-

tend into the stroma of the parenchyma, it is easy to understand how papillary growths are often found in some secondary cysts when the others are filled with glandular material. Multilocular cysts, developed entirely from the tissue of the hilum, appear to contain papillomatous growth alone.

The woodcut (fig. 15) represents an ovary removed by Dr. Bantock from a woman aged thirty-one for the relief of uncontrollable menorrhagia. Its fellow was also removed. This sketch may be instructively compared with fig. 14, the drawing of an ovary affected with incipient multilocular disease of the ordinary kind. From the ovary (fig. 15) projects an oval cyst, from the inner wall of which spring numerous small papillomatous growths, and one of its extremities is closely connected with the tissue of the hilum. In fig. 15 it will be seen that the ovary itself is not invaded by the cyst, but projects above



FIG. 15.—INCIPIENT PAPILLOMATOUS CYST OF THE HILUM. The free portion of the ovary projects above, posteriorly.

it somewhat posteriorly. In fig. 16 this freedom of the parenchymatous portion of the ovary is still more plainly marked; here the tumour was over a foot in diameter before it was emptied of its contents. The large oval cyst in fig. 15 had already forced itself into the broad ligament close to the hilum. In the opposite ovary a similar cyst, only one inch in diameter, sprang from the tissue of the hilum, leaving the parenchyma entirely uninvaded, but already beginning to force itself between the layers of the broad ligament. The larger these papillary cysts grow, the more and more do they invade the ligament, and the more

sessile and troublesome to the operator do they become. But the more that a cyst that was originally developed in the



FIG. 16.—A LARGE PAPILLOMATOUS CYST springing from the Hilum of the Ovary, the greater part of which organ is not involved in the morbid growth. The cyst has forced its way between the layers of the broad ligament as far as the Fallopian tube: this condition has been made more clear by removal of a part of the ligament over the tube and another part over the cyst; the corresponding portion of the wall of the cyst has also been taken away to expose the cavity.

parenchyma grows, the more the ovary loses its normal outline, but the broad ligament remains intact. I shall presently revert to these tumours to consider their clinical peculiarities.

A few years since, when examining the internal generative organs of a seven months' fetus, kindly forwarded to me by my friend Dr. Champneys, I found that both ovaries were in outward appearance normal. Some microscopic sections were made at the physiological laboratory of St. Bartholomew's Hospital by Dr. Vincent Harris. Each ovary measured two-fifths of an inch in length. The right proved to be perfectly normal. Hundreds of Graafian vesicles were scattered over the stroma. In the tissue of the hilum, but there only, were thick-walled vessels. It is significant that whilst in the left ovary not one of the smaller cystic cavities presently to be described could be positively identified as an ovisac, in this, its fellow, the follicles forced themselves on the observer's notice at the first glance. Some of the deeper follicles lay close to the thick-walled vessels with which they are so often confounded.

The ova were very distinct; the epithelial lining of the follicles was far more prominent than the slender endothelium which bounded the lumen of the thick-walled vessels, but much thinner than the lining of the morbid cysts in the left ovary. The spindle-celled stroma of the parenchyma in this normal ovary contrasted strongly with the fibrous and elastic tissue which replaced it in the same organ on the left side.

The left ovary appeared quite flat, like its fellow, and had the sharply-defined, sinuous border characteristic of the ovary in later fetal life. Dr. Harris and myself were much surprised, on examining the sections, to find that the ovary contained three cysts, of almost equal size, lying in a row along its long axis, and plainly visible to the naked eye, which could also detect exuberant vegetations growing from their walls. The cysts were almost perfectly spherical; the largest measured one-twelfth, the smallest one-sixteenth of an inch in diameter.

Examining the sections under the microscope, I found that the cysts, owing to their great relative proportions, encroached equally on the vascular tissue of the hilum, and on the more superficial part of the ovary towards the tunica albuginea. They were surrounded by much condensed fibrous tissue. Into their interior grew an abundance of branched vegetations covered with a stratified layer of columnar epithelium. After repeated examination I could detect cilia on some of the superficial epithelial cells. In the narrower processes of the vegetations the stroma appeared purely fibrous, but in the broader tufts there were epithelial bodies in the midst of the stroma. The tissue at the base of these same tufts passed into the substance of the ovary, external to the boundary of the cyst, the epitheloid cells being traceable throughout, from the stroma at the free end of the tuft to the stroma of the ovary. These cells were clearly the same which, found in the deeper parts of normal ovaries, are admitted to be relics of the tubes of the Wolffian bodies.

The stroma of the parenchyma of the affected ovary contained an unusual amount of elastic fibre and a very scanty supply of the spindle cells seen in normal ovarian tissue—as in the fellow to this ovary. The germinal epithelium had atrophied and become converted into a true condensed, fibrous

tunica albuginea. Towards the surface of the ovary were several enlarged vessels, some full of blood-corpuscles, and all recognisable by their thin endothelium and thick muscular coats. Close to them were several cystic bodies not exceeding one-fiftieth of an inch in diameter, and lined with columnar epithelium precisely similar to that which invested the intracystic growths. At first these small cysts appeared to be true Graafian vesicles, but on careful examination it could be seen that none contained ova, and that the epithelium on their inner walls was made up of much larger cells, arranged with greater regularity than in the cellular lining of a true ovisac in any stage of its development. No such epithelium could be found within any of the normal follicles which swarmed in the opposite ovary. The stroma around these small cysts contained a great number of the epithelial cells already mentioned. In fact, these cysts were most probably an early and younger form of the larger proliferating cavities.

From the above account it will be seen that the vegetations were identical with the papillomatous growths found in cysts after birth. The epithelial elements scattered in the stroma of a normal ovary representing a general atrophy of that part of the Wolffian body which becomes surrounded by ovarian tissue, it is reasonable to suppose that the proliferating cysts in this specimen represented tubes belonging to that body which have, on the other hand, become dilated and cystic. All these changes, normal and morbid, were to be seen in this same specimen. Firstly, the proliferating cysts, then the smaller cystic bodies, one-fiftieth of an inch in diameter, and hardly altered from their original condition as true Wolffian tubes, and, lastly, the epithelial relics of other Wolffian tubes that have undergone normal atrophy. The absence of Graafian vesicles was so marked in this ovary as to lead to the conclusion that the abnormal changes in the Wolffian tubes must have blighted their development at a very early period.

A drawing of this diseased foetal ovary will be found in the 'Transactions of the Pathological Society' for 1881, and in the last edition of Sir Spencer Wells' work, page 34. I think that all must admit that this remarkable case throws a great deal of light on the origin of papillomatous cysts of the ovary. The

follicular elements were completely suppressed, and the Wolffian structures had become over-developed, with the result of producing a row of cysts filled with the most characteristic papillomatous growths. I shall refer once more to this particular case when discussing the question of morbid growths within the Fallopian tube. The accidental discovery of the disease in this case is a strong testimony in favour of the value of systematic examination of still-born children, as advocated by Mr. J. B. Sutton in a communication read in March 1884 at a meeting of the Royal Medical and Chirurgical Society. As far as ovarian histology and pathology are concerned, it is very desirable that human foetal ovaries should be studied, as the relation of the stroma to the follicles and Wolffian tubes is not the same in many of the lower mammalia as it is in woman.

The papillomatous growths, of which so much is being said in these pages, form, wherever they may develop, very luxuriant cauliflower masses, with free tags or villous processes in great abundance. They are sometimes gritty through psammomatous changes, and bleed freely when handled during operation. Their free surface is invested with a layer of cylindrical epithelium, the cells of which are never so extremely long as those lining glandular growths, but they generally bear cilia. Each process contains a blood vessel, often obliterated; the connective tissue basis is scanty, and chondrification or development of sarcomatous matter is rare. I have never detected goblet or calice cells on the epithelium of these growths. Some pathologists believe that papillomatous and glandular intracystic ovarian growths are identical, excepting that the epithelial elements predominate in the former, and the connective tissue basis in the latter. But not only is the seat of origin of the two forms of growth quite different, but the epithelium of the glandular growths, so far from being subservient to its connective tissue basis, is very active in pushing itself in all directions, forming acini and cysts, and secreting a dense fluid. In papillomatous growths, though vessels abound and increase of papillary projections progresses actively, none of these more complicated processes take place, and the fluid contents of the cysts in which they grow is almost devoid of organic products.

It is not always easy to decide, in the case of a patient who has undergone and recovered from an operation, whether a papillomatous cyst be of ovarian origin or entirely developed, from the first, from the broad ligament. For reasons already given, papillomata are liable to develop in the parovarium, and also in the tissue of the hilum of the ovary; and as some of this tissue extends far into the parenchyma, that portion of the ovary may, in rare cases, be involved, and all trace of the normal outline of the organ destroyed. Still, even when a papillomatous hilum cyst has reached a very considerable size, the flattened parenchymatous part of the ovary, with its convex border, often projects very distinctly from the back of the tumour, and on section follicles and corpora lutea can be detected. In one case, where the tumour was removed by Dr. Bantock, the cyst held several pints of fluid, and was full of papillomatous growths; still, the free part of the ovary projected freely from its posterior aspect. The follicles were distinct, and the papillomatous growths that had completely replaced the normal tissue of the hilum had invaded the parenchyma to a very limited extent. More frequently the ovary is concealed, not by destruction of the parenchyma by papillary invasion, but by growth of papillomata on its free surface. This complication generally follows rupture of the cyst.

The opposite condition, where, instead of papillomatous hilum cysts invading the broad ligament, cysts of the same kind commence in the Wolffian relics in the folds of that ligament, and grow so rapidly as to bury the ovary in cauliflower masses, is not uncommon. In such cases the papillomatous growths are particularly liable to burst through their cyst-walls and grow over to the exterior of the ovary, as in cases, above referred to, where the growths are ovarian in origin. There is a specimen in the Museum of the Royal College of Surgeons where the ovaries are completely concealed in this manner; the broad ligaments are infested with papillomatous growths, which have burst from their cystic coverings; and it was only after a prolonged search that I could find the ovaries, deeply buried in the growths.

In another case, where papillomatous tumours were entirely of broad ligament origin, I found the ovaries buried in the

papillomatous masses, but their surfaces were normal, and not a single papillomatous body could be found upon them. The patient was a young woman aged thirty-three; an exploratory operation was made by Sir Spencer Wells in November 1877; a large cyst was discovered adhering so intimately to the abdominal wall that it could not be removed; it was filled with papillomatous masses and clear fluid. The cyst was drained, but the patient died on the eighth day. It must here be observed, as in the chapter on solid tumours, that papillomatous growths are very intolerant of operative interference; and as far as immediate results are concerned, it appears more dangerous to leave them behind than to leave sarcomatous deposits in the abdominal cavity.

At the necropsy of this case, I found that the cyst adhered to the parietes, the liver, the diaphragm, the stomach, the great omentum, and the large intestines. The papillomatous masses grew mostly from its lower part. On removing this portion of the cyst, I discovered that the whole pelvic cavity was filled with masses of thin-walled multilocular cysts, containing clear, pale, yellow fluid, and papillomatous outgrowths from their walls. I have ever found that the fluid is clear, and generally colourless, in small papillomatous cysts; the presence of glairy fluid probably indicates the admixture of glandular elements, which is easily understood when the tumour is ovarian—for it must be remembered that the tissues of the hilum and the parenchyma invade each other's limits. In this case, the cysts varied in size from the dimensions of a cob-nut to those of a large orange. They were crowded into Douglas's space, and clustered thickly over the summit of the uterus and bladder. This power of invasion is very characteristic; even the cystic nature of the growth is reproduced in secondary deposits, as in the case of ruptured glandular cysts of the ovary. After examining the papillary masses carefully, I came upon both ovaries. They were small and red, and there were no papillomatous growths, either free or encysted, on their surfaces.

I have assisted at nine operations for the removal of papillomatous cysts where the hilum, at least, of the ovary was involved, and the layers of the broad ligament invaded. It is more frequent for hilum cysts to invade that ligament than for broad-

ligament cysts to attack the hilum, since cysts in the hilum meet least resistance in the direction of the cellular tissue between the layers of the broad ligament, whilst broad ligament cysts meet less resistance where they bulge anteriorly and posteriorly from their ligament, and stretch the Fallopian tube, than where they press against the hilum of the ovary. This probably accounts, on the other hand, for the frequent immunity of the ovary in cases of papillomatous broad ligament cysts, as in the case above described; when that organ is invaded in these instances, it is its surface, as already observed, that is affected.

On the other hand, I have been present at four operations where ovaries have been removed for papillary tumours which did not invade the broad ligament; that is to say, the tumours had pedicles. In twenty-four cases where I assisted at the operation, sessile cysts infiltrating the broad ligament were removed, more or less completely, but their origin could not be ascertained; none of these contained glandular growths, most were multilocular, but papillomatous growths did not exist. Several, I believe, were multiple simple broad ligament cysts. In four other cases I aided my colleagues in the removal of papillomatous sessile cysts, where it was impossible to say whether the hilum or the broad ligament was the primary seat of disease. In another case the cyst was sessile, clearly ovarian, and apparently dermoid, in one respect; and in another the dermoid character was certain. Lastly, I have seen two cases where a sessile cystic tumour of the ovary was removed, and this proved to be an undoubted case of glandular cystic disease invading the hilum and the broad ligament. It is easy to understand why this condition should be rare: just as broad-ligament cysts, for reasons above given, do not as a rule invade the hilum, but grow in other directions, so glandular cysts arising in the parenchyma do not tend to grow in the direction of the hilum, but bulge out towards the periphery of the ovary itself, where there is no resistance whatever.

All sessile cysts are troublesome to the operator; and, as they so often contain papillomatous growths, unsatisfactory results often occur sooner or later after removal. They are, therefore, of great clinical, as well as pathological importance;

and I shall now describe some of the cases, as above classified, at length.

Firstly come the nine cases where the evidence that the hilum was the primary seat of papillomatous cystic disease was very strong. The first was in a patient aged thirty-eight, in Mr. Thornton's wards. The tumour formed a large multilocular cyst full of papillary growths. A very broad and vascular band, consisting of the broad ligament close to the hilum, and with its layers parted by the advance of the growth, constituted a sort of pedicle, whence the tumour had to be partly shelled out; the tumour also adhered strongly to Douglas's pouch, by an area of adhesion as extensive as the false pedicle. Drainage was necessary; the patient recovered.

The second, where the patient was thirty-three years of age, and under the care of Dr. Bantock, was a good example of the difficulties attending cases of this kind. A large irregular swelling occupied the abdomen; there was a deep cleft on its surface, and the whole felt like one cyst, with intestine lying across the middle, but on percussion no vibration could be transmitted from one side to the other. On opening the abdominal cavity a pint or two of ascitic fluid escaped; then a cystic ovary came into view. The false pedicle was extremely broad, and the lower and outer part adhered to the cæcum; internally the tumour almost reached the uterus. I must observe that by 'pedicle' alone I mean a true pedicle—that is, the normal tube, broad ligament, and ovarian ligament—whilst by false pedicle I mean the line of structures that the operator cuts through in removing the tumour, after having ligatured the proximal side, either by transfixion or piece by piece, as best he may in cases like those that I am now describing. After that the ovary had been tapped, and much bloody fluid and papillomatous masses removed, the uterus was raised out of the pelvis, and stood well out of the wound, being nearly double its usual size; small villous growths sprang from its surface. It was then found that the left ovary was also cystic. Its contents were a puriform fluid and papillomatous growths, which studded its interior, and it had forced itself into the folds of the broad ligament as far as the tube, pushing up also the round ligament of the uterus in front. Still, a pedicle could be formed between the cyst and

the uterus, and was secured by transfixion. The base of the right cyst had to be shelled out of its capsule of broad ligament, which was transfixed twice with silk ligatures. The ligament was not very vascular. No drainage tube was inserted; the case made a good recovery.

The third was a very bad case. The patient was forty-six years of age; the cyst had burst, and the bladder, uterus, and pelvic peritoneum were studded with papillary growths. The cyst had forced itself between the layers of the broad ligament, and grown backwards, pushing itself under the peritoneum, till at one point its wall touched the common iliac arteries. It was mostly enucleated. The patient died on the fifth day; there was thrombosis of the right femoral vein, which accounted for a swollen state of the right lower extremity before the operation. The papillomatous deposits had reached the peritoneal lining of the diaphragm.

The fourth was in a woman aged sixty-one. The papillomatous growths had infiltrations of sarcomatous material at their bases; the false pedicle was hard to make—for in these cases they literally have to be planned out—and it was still harder to secure the vessels which kept slipping. The opposite ovary was the seat of small simple cysts projecting from its parenchyma. The patient, under Mr. Thornton's care, recovered.

The fifth case, in a woman aged fifty, was like the third, an instance of double papillomatous cystic disease of the ovaries, and also resembled it in terminating fatally. The false pedicle on the right side was hard to secure, and two large arteries were tied separately. The left tumour, though very small, was still more sessile than the right; it was separated from its base by the thermo-cautery, and then the tissues on the proximal side of the burnt surface were ligatured. The patient died on the tenth day. The left false pedicle adhered by its raw surface to the rectum; there was septic fluid in Douglas's pouch, and both kidneys were diseased in the manner described in another chapter.

The sixth case, occurring in a woman sixty years old, terminated favourably. The cyst contained clear watery fluid and incipient papillomatous growths; it had forced the layers of the

broad ligament so far apart that in taking it away the uterine tissue was wounded, and the thermo-cautery had to be applied. In the seventh case the patient was thirty years old, the peritoneum was full of ascitic fluid, the cyst had a very dull wall, as though partly gangrenous. Mr. Thornton, who operated, found that it had a sessile and broad attachment to the right side of the uterus; it was enucleated from its broad ligament capsule, forceps being applied as vessels were severed, the tube and main vessels were then secured by transfixion, and afterwards the base was transfixed several times, and a 'bag-mouth' ligature applied round the whole false pedicle. There were numerous omental adhesions. The patient recovered. In the eighth case, a patient aged thirty-five, the cyst was so universally adherent that it could not be removed; the patient recovered from the operation.

The ninth case occurred in a woman aged forty-five, under the care of Dr. Bantock. On opening the abdominal cavity, a small tumour with very large veins on its dull-red surface was exposed. It was tapped, and four pints of a glairy greenish albuminous fluid of high specific gravity escaped. On drawing up the collapsed cyst, the parenchyma of the ovary was discovered projecting very distinctly from the lower part of the cyst; the natural outline of the free border of the ovary was well preserved. A false pedicle was readily formed by transfixion, as the cyst had not forced itself quite up to the uterus, and the tumour cut away, with the capsule entire. This capsule, the broad ligament, had given the reddish colour to the surface of the cyst; in many cases of this kind, but especially in this instance, the tumour at first sight looks like a uterine myoma. I found that the wall of the cyst was continuous with the ovary, and not thin, as is the case in papillary cysts confined to the broad ligament alone, but thick, dull-white, and corrugated, like the surface of the ovary close to the hilum. The patient recovered.

I will now make some mention of the four cases where I have witnessed the removal of ovarian tumours that bore papillomatous contents, yet had at the same time true pedicles, with no encroachment on the layers of the broad ligament; in fact, the pedicle was in each case like that of a typical multi-

locular ovarian cyst devoid of solid growths. The first was removed by Mr. Thornton from a robust country girl, aged seventeen. The tumour formed a large cyst with secondary cysts containing papillary growths. The pedicle was of a fair length, and not difficult to secure. There were omental adhesions.

In the second case, the patient was forty-seven years old, and under the care of the same surgeon. The tumour was similar to that in the last case; the pedicle was long and narrow, and readily secured. What makes this case of considerable pathological interest is the fact that a small thin-walled cyst lay between the layers of the broad ligament and contained papillary outgrowths. This cyst bulged from the ligament, so that its sides touched the ovarian tumour, but the two growths were not continuous. Some unknown stimulus had caused the simultaneous growth of papillomata in two different parts where Wolffian relics existed.

The third also occurred in a patient of Mr. Thornton's, forty years of age. A year previously a partly solid tumour of the left ovary had been removed by the same operator. The right ovary was found to be converted into a large unilocular cyst, covered externally with flakes of lymph and ochreous from degeneration. A few papillomatous outgrowths sprang from its inner walls, which were lined with organised fibrine; the fluid contents were thick and brown. The pedicle was broad and thin, the stump of the opposite ovary healthy.

The last case occurred in Dr. Bantock's wards. The patient was middle-aged, and had two tumours, each ovary being converted into a large multilocular cyst containing papillomatous growths. There were universal adhesions; the parietal peritoneum was much thickened, and the omentum thick and indurated. One pedicle was very long and twisted, the other still longer and thinner, consisting of an atrophied tube. The adhesions were, doubtless, an indirect result of the twisting of the pedicle. The separation of the adhesions, and the thinness of the cyst walls, which broke down very readily when handled firmly, caused the operation to be very protracted. A drainage tube was passed into Douglas's pouch. None of these four operations ended fatally.

It is important to observe that in none of these four cases

were the papillomatous intra-cystic growths either numerous or exuberant. Under this condition it is natural that the growth should not force itself into the layers of the broad ligament, a complication which invariably occurs when the papillary disease is advanced. It is probable that in these cases the disease originated in those Wolffian relics that exist in the parenchymatous part of the ovary, as in the case of mixed glandular and papillomatous cysts. In the chapter on the former type, I observed that glandular growths with papillary elevations on their surfaces must not be taken for papillomatous growths.

In twenty-four cases that I have seen submitted to operation the tumour was sessile, the operation very troublesome, and no solid matter could be found in the interior of the cysts. Out of these a very large majority were ordinary multilocular cysts that had pushed apart the layers of the broad ligament, and often burrowed under the pelvic or even the parietal peritoneum. This is quite the exception in the case of such cysts, and appears to be the result of a rapid growth of the cystic elements in the parenchyma towards the hilum, but certain peculiar dispositions of the peritoneum decidedly favour the anomaly. Meredith, Coblenz, and others have described cases where, undoubtedly, these cysts have burrowed under the parietal layer of the peritoneum, so as to lie directly under the abdominal walls, the operator finding that no peritoneum covers the tumour, and in other cases the tumours have burrowed under the peritoneum lining the back of the pelvis, and even the lumbar region, so as to lie against the great vessels, as in the case of papillomatous cyst above described. These cases are authenticated by the competent observers who have described them; but, as every prosector and demonstrator of anatomy is aware, it is not always easy to trace abnormal dispositions of the peritoneal folds, even where no tumours exist and the entire abdominal cavity can be exposed to the light in a dissecting-room. It is far more difficult to identify the relations of the peritoneum through the comparatively limited incision which the surgeon makes for the purpose of removing an ovarian tumour. The form, appearance, and constant position of the Fallopian tube renders it very easy to decide

whether a cyst has forced itself between the layers of the broad ligament, or confined itself to the ovary. This can be often ascertained at a glance. But the more extensive encroachments on the peritoneum cannot always be correctly defined at an operation. In several cases I strongly suspected that the multilocular cysts were of broad ligament origin, but I had no opportunity of examining their walls. In four more cases, none of which were fatal, but all very tedious to the operator and his assistants, there was papillomatous disease involving the broad ligament, but it was very uncertain how far the ovary was involved, or whether it was not left behind. In one case the growths concealed the pelvic structures, and could not all be removed. It is tolerably certain that one or more of these cases were examples of primary broad ligament disease, like Sir Spencer Wells's case described above.

In five cases there was little or no doubt that the disease was papillomatous and confined to the broad ligament, whence, in one of the cases, the tumour could be shelled out. In another, a woman aged thirty-six, the ovaries appeared to be separate, but the tumour could not be removed. In the third, a woman aged twenty-five, under the care of Dr. Bantock, a tumour of this kind was enucleated from each broad ligament; the patient made a good recovery. The fourth case was in a woman thirty-five years of age, under the care of the same surgeon. The tumour formed a fluctuating mass, filling the front of the abdomen and also the left flank. It was universally adherent and papillomatous, and had partly forced its way under the parietal peritoneum. It touched the bladder directly; this organ was lacerated, but successfully sewn up again, during the operation, which was tedious, even for a case of this kind. Both ovaries were perfectly normal, and the uterus was distinct from the cyst. As the broad ligament had not been forced entirely apart, it is just possible that the tumour originated in some relics of Gartner's duct remaining in the vaginal wall. Coblenz believes in this pathological condition. In this case, however, it is remarkable, as the tumour was partly in the broad ligament and touched the ovary, that the uterus was quite uninvolved, if the tumour really originated in the vaginal wall. It seems far more likely, considering its relations, that

it arose in the Wolffian relics contained in the folds of the ligament—that is, from the parovarium—and instead of pushing the layers of the ligament apart till it touched the Fallopian tube, it had grown downwards and forwards. This patient made a good recovery. To the above four cases I may add a somewhat doubtful one: a patient aged thirty-five, where, as in the second, the operation had to be given up. It was probably very like the case now illustrated by the specimen in the Museum of the College of Surgeons, above described, where the ovaries were completely concealed by papillary growths, although their interiors contained none. I must also add Sir Spencer Wells's case already described in this chapter; here the ovaries were entirely distinct from the diseased masses.

In one instance, a patient aged forty-seven, Mr. Thornton removed a sessile ovarian tumour, where several pints of liquid fat were found in one of its secondary cavities. The opposite (right) Fallopian tube and the vermiform appendix adhered to the cyst, and the construction of a false pedicle gave the operator great trouble; the patient recovered. This is the only case but one of a sessile ovarian tumour that I have had the opportunity of examining, that appeared to be dermoid. Considering the nature of dermoid structures, it is rather remarkable that they do not more frequently force their way into the broad ligament. A more evident instance of a dermoid cyst invading the broad ligament will be found in the chapter on cysts of that class.

In one case, a woman aged forty-four, under the care of Dr. Bantock, a multilocular ovarian cyst had forced itself into the layers of the broad ligament, touching the side of the uterus, and extending deeply into the pelvis. The pelvic portion was first removed, then the uterine attachment was transfixed and cut away. On examining the tumour, I found that the secondary cysts contained masses of solid glandular growths, so often seen in pedunculated multilocular ovarian cysts, but no papillomatous structures. It is evident that glandular cystomata very rarely invade the broad ligament.

I have very recently seen a second case of a glandular cyst invading the broad ligament in the wards of the same surgeon. The patient was twenty-four years of age, and a firm, but indis-

could not prove that it was a follicle. The contents were a few grains of semifluid sebaceous matter. That ova require the agency of spermatozoa before the changes that can produce a perfect foetus can be set in action there can be no doubt. There is no known reason why an ovum should not develop more or less shapeless masses of definite tissues without impregnation. It must be remembered, too, that the *membrana granulosa* is more than a mere epithelial surface; perhaps the ovum may influence its cells. All is, however, hypothetical. The dermoid ovarian cyst question appears to me to be closely and inseparably linked with some of the most profound mysteries of organic life.

To talk of parthenogenesis or of foetal inclusion is, in reality, not giving an explanation. In Molière's '*Malade Imaginaire*,' Argan, the principal character, undergoes a mock examination, in a scene designed by the dramatist as a satire against medical education in Paris under the rule of Louis XIV. He is asked in dog-Latin the cause and reason why opium sends a man to sleep, and replies: 'I have been asked by the learned Doctor the cause and reason why opium produces sleep, to which I answer: because there is in it a dormitive virtue, the nature of which is to make the senses drowsy.' To explain the growth of hair, bone, teeth, and glands in the ovary of an unimpregnated subject by saying that it is due to parthenogenesis is equally unscientific. Mr. Pepper, in his '*Elements of Surgical Pathology*,' disposes of the foetal inclusion theory by introducing one of the most forcible arguments that have ever been brought against it—that dermoid cysts 'are not the outcome of so-called foetal inclusions is proved by the fact of their having occasionally been found to contain more than a hundred teeth.'

These cysts are so remarkable that they have attracted the attention of pathologists very extensively during the past few years, especially since the establishment of ovariectomy as a recognised surgical operation. It is more profitable to continue the examination of the tissues included within dermoid cysts than to indulge in speculations as to the origin of tumours of this class. I will now relate my own experience of their histological and clinical peculiarities.

In the thirty-one cases I have seen, the ages of the patients

were as follows: fourteen years old, 1 case; seventeen, 1; twenty, 1; twenty-one, 2; twenty-two, 2; twenty-seven, 1; thirty, 2; thirty-one, 1; thirty-two, 2; thirty-four, 1; thirty-five, 1; thirty-six, 1; thirty-seven, 2; thirty-eight, 1; thirty-nine, 1; forty-one, 2; forty-two, 1; forty-eight, 1; fifty (about), 1; fifty-three, 1; fifty-eight, 1; sixty-three, 1; age not specified, 3: total, 31.

The youngest patient, aged fourteen, was a very healthy girl from a village in Nottinghamshire; the catamenia had never appeared; the mammary glands were infantile, but the axillary and pubic hair was developed.¹ The oldest, sixty-three years of age, had a large multilocular cyst of the left ovary, one of the loculi containing hair, sebaceous matter, and ossifying cartilage, most of the remainder being filled with dark chocolate-coloured glairy fluid. The opposite ovary was the size of a large orange, full of hair and sebaceous matter, and containing ossifying cartilage, but no teeth in its walls. It adhered strongly to Douglas's pouch. Both these cases were in Dr. Bantock's wards, and recovered from the operation.

In eight cases teeth were found; in one they amounted to over twenty in number; in some of the remaining twenty-three, solitary teeth might have been overlooked; in two cases I have not recorded the contents. Nearly all contained hair, but in three I failed to find any. The hair was generally pale; in one case it was quite black, darker than the patient's hair on external parts.

In more than half the cases the free contents were, at least in the secondary cysts, chiefly sebaceous, and resembled in

¹ In August 1883, Dr. Roemer successfully operated, at the Augusta Hospital, Berlin, on an infant aged 1 year and 8 months, removing a dermoid ovarian tumour 'the size of the child's head.' See *London Medical Record*, June 1884. This case appears to be the youngest where ovariectomy has been performed. Neville, of Dublin, operated on a patient, aged 2 years and 11 months, with fatal results within two hours. Busch's and Alcott's cases were both 2 years old; neither recovered. The following five were successful, but the patients were older. Schwartz's case was 4 years old; Barker's two cases were 7 years old; Knowsley Thornton's case was also 7; Cupples', Chenowetts' and Spencer Wells's were each 8 years old. A collection of cases of ovariectomy performed on older children will be found in an article by Dr. Chenowetts in the *American Journal of Obstetrics*, July 1882, p. 625. For a full account of Dr. Roemer's case, with references to the others above mentioned, see *London Medical Record*, article 2684.

every respect the pultaceous grease which fills up sebaceous cysts on the head; this material was often very intimately mixed up with the hairs. In such cases, the operator often first discovered the true nature of the tumour when plunging his hand into its cavity, when his fingers became at once covered with grease and hair. When the secondary cysts were filled with sebaceous matter, the cavity of the main cyst generally contained a greasy fluid of a chocolate colour; when glandular elements existed, there was a tendency to glairiness; and in one instance of this kind the fluid was clear and albuminous, glairy, and almost entirely free from grease. On the other hand, when dermoid structures freely grew from the inner wall of the main cyst, the contents sometimes resembled half-liquid chocolate, and in one case were of the colour of moist curry-powder. When the characteristic greasy and chocolate-coloured fluid, which seldom exceeded five or six pints in amount, had lain a few minutes exposed in an open pail or basin, beautiful hexagonal patterns, formed by cholesterine crystals, would appear on its surface. The significance of the varieties of the fluid and semifluid contents of these dermoid cysts could be no mystery. The greasiness was due to sebaceous elements, and the colour to alterations in effused blood.

In two cases some of the cavities were filled with pellets of sebaceous matter resembling sugar-coated pills, a condition already noted by Rokitansky, Routh, and others. In a case of incipient dermoid disease—the ovary being about three inches in its longest diameter, and the fellow of a large dermoid tumour—two cysts contained, together with hair, a very pure white putty-like material; it resembled the ‘Chinese white’ of colourmen. It was simply pure sebum. In seven instances free fat predominated in the secondary cavities; it was entirely fluid, and closely resembled olive oil in one of these cases; in another, it was mixed with glairy secretion from glandular elements in the tumour, so as to appear as a pale yellow glycerine-like fluid; in the remainder the fat was semi-solid; it did not appear to trouble the operator as much as the more common sebaceous matter, as it could more readily be washed off the fingers. In another case, under my own care, and described in the chapter on twisting of the pedicle, there was a

quantity of a pomatum-like material in the main cyst, apparently due to the admixture of a small amount of sebaceous matter with common fat.

In six cases the pedicle was twisted; and reference to some of these will be found in the chapter on that complication, which, in the case of ordinary multilocular cysts, causes the outer surface of the tumour to lose its natural shiny silvery appearance. The surface of a dermoid cyst is, however, often dull and brownish, even when the pedicle is not twisted. As most dermoid cysts do not fluctuate freely on palpation, but feel elastic—especially if filled with hair and sebaceous material—and as the dull-brown outer surface of the main wall resembles uterine tissue, these cases sometimes puzzle the operator. In one instance there was marked pigmentation around the umbilicus; here no uterine complication existed.

In seven of the cases of dermoid cyst that I have seen, both ovaries were involved. One of these, under my own care, is described in the chapter on twisted pedicle. In one, a patient fifty-three years of age, the rectum¹ and stomach were the seat of malignant disease, in which the omentum was also involved. The right ovary was converted into a large dermoid cyst. The left, now in the pathological series of the Museum of the Royal College of Surgeons (4506), measured about three inches in its longest diameter. It contained one cystic cavity filled with fat and short hairs, and minute cysts in the stroma filled with liquid oil. The patient sank from exhaustion thirty-four hours after the operation.

One of these cases, under the care of Mr. Thornton, was very remarkable. The patient was thirty-seven years of age, and before operation there was a suspicion that the tumour might be a fibroid outgrowth from the uterus, or a cystic ovary with a twisted pedicle. On opening the abdominal cavity a large tumour of the right ovary was first removed; it was full of sebaceous matter and spicula of bone, which partly escaped into the peritoneal cavity, and were with difficulty removed. There were numerous peritoneal adhesions. The left ovary

¹ Microscopical sections of the new growth in this part of the intestine bore the appearances of columnar epithelioma. Neither ovarian tumour contained a trace of malignant disease.

was converted into a cystic body of very irregular shape. I prepared it for the Museum of the Royal College of Surgeons, where it is now preserved (Pathological Series, 4516). It consisted of three large cysts from two to three inches in diameter, and arranged in an irregular manner, the middle cyst bulging forwards, whilst the inner and outer cysts projected backwards towards each other. They were divided by more or less complete septa, and were filled with sebaceous material. There were pedunculated cysts in the broad ligament, and the fimbriæ of the Fallopian tube were abnormally developed; a small sessile cyst also lay over the site of the parovarium. The dermoid cyst, when fresh, had a most curious appearance, resembling a large sausage twisted in three directions. Its form was probably determined by the pressure of the tumour of the right ovary. The third case of double dermoid cyst has already been referred to above; pale yellow fat like pomatum was found in one cyst; it is more minutely and clinically described in the chapter on twisted pedicle; the smaller tumour was the right ovary, converted into a heavy oval body three inches in its long diameter; its pedicle was stretched, twisted, and atrophied, and it contained a dense mass of hair and fat.

The fourth case of double dermoid cyst was in a patient fifty-one years of age; the right was large and strongly adherent to the abdominal walls. This, too, was a case of twisted pedicle; that structure was thin and its vessels obliterated. Here, in fact, is another interesting point in ovarian pathology: the adhesions, very vascular, kept up the vitality of the cyst, and saved it from gangrene. The left tumour was the size of a large orange, and stuffed with hair and fat. The next case, under the care of Mr. Thornton, was that of a woman, aged forty-two. A few years before operation she suffered from a copious vaginal discharge, and she declared that the tumour, which then existed, diminished in size; at the operation the abdominal walls were flaccid, as in the third of these cases. The tumour was a large dermoid cyst, full of small teeth approaching the type of normal bicuspid. The opposite ovary was below the normal size. It contained a small cyst, from the inner wall of which fine hairs grew. As I have already ob-

served, all the wall being converted into epidermis, I could not prove that the cyst was a dilated Graafian follicle.

The sixth case was that of a patient under the care of Dr. Bantock, a woman sixty-three years old. This is a great age for the occurrence of dermoid disease in the ovary; I have been informed that some authorities have denied its existence in middle-aged or old women. In this case an exceedingly irregular fluctuating tumour, very freely movable, distended the abdominal walls to above the umbilicus. A large multilocular dermoid cyst of the left ovary was found. One of the loculi contained hair, sebaceous matter, and ossifying cartilage; most of the remainder were filled with dark chocolate-coloured fluid. Dermoid cysts generally include but few secondary cysts, and these are often mere cavities in the main wall, hardly bulging into the main cavity. The opposite ovary formed a second dermoid cyst about the size of a large orange; its walls were unusually thin for a tumour of this kind, and one secondary cyst contained cartilage, but no bone nor teeth. On tapping the main cyst much hair and sebaceous material was encountered, giving us, as I was assisting the operator, great trouble. The cyst lay deep in the pelvis with a strong adhesion to Douglas's pouch; this was secured by a clamp forceps, and divided, then the pedicle was transfixed, ligatured, and cut away. The patient made a very good recovery. In fact, only three out of the large number of cases of removal of dermoid tumours that I have seen ended fatally, and one of these was No. 2 in the series of cases of unfavourable changes in the ligatured pedicle, described in the chapter on that subject.

The last case of double dermoid cystic disease was in a patient aged thirty-eight. The relations of one cyst were difficult to trace during the operation; it was believed by the operator that it was separate from the ovary, and entirely within the folds of the broad ligament; it was adherent to the uterus, and part of the Fallopian tube was matted on to its wall by adhesions. In the chapter on sessile tumours, I have referred to a case where a growth of this kind was partly dermoid. In this case, now under consideration, there was happily no opportunity for confirming the true relations of the cyst, for the patient made a good recovery. The opposite

ovary was about double the normal size, and contained two dermoid cysts filled with the Chinese-white, putty-like material already described.

In three cases of dermoid ovarian tumour, the opposite ovary was converted into a multilocular cyst. In the first case the patient was thirty-nine years of age. The left ovary formed a large multilocular cyst with glandular contents, and a broad, short pedicle with very large veins. The right was converted into a small dermoid cyst containing much hair, sebaceous matter, and a pint or more of liquid fat. Its pedicle was also broad and short. The patient died with symptoms of very acute bronchitis on the third day. The second case was in a patient aged thirty-five. Before operation, two fluctuating tumours could be felt in the abdomen, and the fundus of the uterus was plainly to be detected above the pubes, in front of the tumours. The left mass proved to be a small multilocular ovarian cyst with a short and broad pedicle; the right was a spherical dermoid cyst full of hair and sebaceous material. Its pedicle was twisted and very thin, and the operator, Dr. Bantock, readily secured that structure by simply tying a silk ligature around it. Its vein was plugged and dilated; this peculiarity is described in the chapter on twisting of the pedicle. The patient made a good recovery.

In the third case the patient, under the care of Mr. Thornton, was about fifty years old. I have already referred to the question of age in relation to dermoid ovarian tumours. The right ovary was converted into a small multilocular cyst that had leaked a little; it contained a glairy, clear fluid, and some of the secondary cysts had tough deposits in their walls, which at other parts were atrophied, and had even given way so that the cavities of the cysts communicated with each other. I examined these deposits and found that they were dense cicatricial tissue and not cartilage, nor could I find any dermoid elements in this tumour. On the other hand, the left ovary was converted into a dermoid cyst about four inches in diameter; it contained sebaceous matter and hair.

In four cases the tumour was mixed, being partly a multilocular cyst with glairy fluid contents and glandular solid matter, as a rule, in the secondary cavities, and partly dermoid

In the first case the patient, twenty-eight years of age, was under the care of Sir Spencer Wells. On opening the abdominal cavity, the main cyst was found to be so strongly adherent to the abdominal walls that it could not safely be removed. A large secondary cyst grew from its interior, springing by a kind of pedicle from its inner wall, and covered with lymph and clots; the fluid in the main cyst was albuminous, clear, and glairy. A clamp was applied to the pedicle of the inner cyst, which was then cut away. This cyst contained sebaceous matter, hair, and flat bones in great quantity; these latter formed hard plates with irregular margins, resembling the facial bones of a teleostean fish. There were no teeth. The patient was pregnant during operation; she made a good recovery, and was alive four years later. (The case is No. 879 in Sir Spencer Wells's series.)

The next case, which was under the care of Dr. Bantock, is that to which reference has been already made in speaking of the age of patients subject to dermoid cystic disease, the patient being only fourteen years of age. The tumour was a multilocular cyst with glairy albuminous fluid in its main and in most of its secondary cavities, but two small secondary cysts contained hair, sebaceous matter, and spicula of bone. There were no adhesions, and its pedicle was broad and thin; it contained large vessels. It was readily secured, and the patient made a rapid recovery. The third case was under the care of the same surgeon. The patient was twenty-two years of age; the cyst had ruptured, and was much reduced in size compared to what it had been a few weeks before operation. The rupture was a circular hole, about an inch in diameter, and completely blocked by an unruptured secondary cyst, that probably was not the cause of the rupture, for the tissue of the main wall was degenerate around the aperture and elsewhere; it had become approximated to the aperture when the main wall had fallen in after rupture. Reference will be found to cases of this kind in the chapter on rupture of ovarian cysts. In this case the cyst was multilocular and full of glairy fluid; in some of the smaller cysts were hair, skin, teeth, and bony plates. In one cavity lay a large knob of hyaline cartilage nearly three-quarters of an inch in diameter, also two tuberosi-

ties about two inches in diameter, composed of dark-red, firm, fleshy material. More will be said of this material when I come to speak of malignant characters of dermoid tumours.

The fourth case of a mixed tumour of this class was operated upon by Mr. Thornton in December 1880. The patient was about forty-eight years of age. The cyst was very large and multilocular; several gallons of a pale yellow, viscid fluid were withdrawn by the trocar; and the main cyst wall was very thin. Some of the secondary cavities contained hair, teeth, and sebaceous material.

Before speaking of malignant characters, and dismissing one case under Mr. Thornton's care, where a dermoid cyst burst into the bladder, and where, after emptying the cyst cavity of fœtid sebaceous contents, the edges of the cyst wall were fixed to the edges of the abdominal wound, with satisfactory results, I will revert to the usual histological characters of dermoid cysts.

A very fine example is in the Museum of the Royal College of Surgeons (Pathological Series, 4512). It is a small denticerous cyst of an ovary, removed by Dr. Bantock in 1879. The patient was a young single woman, the tumour had been observed for about a year, and had occasionally caused severe pain, as is not rarely the case with small heavy dermoid cysts. There were firm omental adhesions. The cyst contained several pints of thick chocolate-coloured, semi-fluid, material. On preparing the tumour for the College Museum, I found in its inner wall a semilunar plate of porous bone over two inches in length, bearing towards its inner extremity several teeth, well formed, and resembling small molars and bicuspid (fig. 17). The bone was covered by a soft membrane, which could hardly be called a gum, its inner part in contact with the bone resembled periosteum, but its outer aspect bore sebaceous follicles and very short hairs. The fang of one of the teeth grew entirely from this membrane, quite unconnected with the bone by any socket. Indeed, teeth are often found growing in dermoid cysts where no bone exists.

On the other hand, I have repeatedly found true sockets, with their teeth firmly fixed in them, in both the kinds of bone that are developed in dermoid cysts, that is in the flat porous plates like the facial bones of certain fishes, and in the

heavy tubercular masses of ivory-like bone described in Sir Spencer Wells's work. The so-called cavities of reserve are often merely sockets developed very close to other teeth, as in



FIG. 17.—DERMOID CYST OF THE OVARY.

No. 261 in the College Museum, which I found in a dermoid cyst removed from a young girl by Mr. Thornton. It is a piece of bone resembling a portion of the alveolar process of a jaw. It contains a well-formed tooth in a perfect socket, and the crown only of a second tooth in a shallow socket. It was seated, together with a patch of hair, on the inner side of the cyst wall. The second socket has clearly been developed independently of that which bears the more perfect tooth. I have found that when teeth are numerous the bicuspid type predominates. When the dental element is scanty the individual teeth have generally a canine or incisor type.

The epidermic structures so abundant in dermoid cysts are well known to pathologists, and have been often described. An abundant development of sebaceous follicles is exceedingly common. In one specimen in my possession sweat glands are conspicuous, but they are not always so abundant as the former

kind of gland. The epidermic cells are sometimes arranged in a very thin, sometimes in a very thick layer; often they form a smooth, even covering to the subjacent structures; in other cases there are papillæ. I have found very deep involutions of epidermis, dipping one-twentieth of an inch or deeper into the subjacent tissues, but lined with the characteristic flattened cells, even in the deepest part. The *rete Malpighii* is often well developed, pigment may be abundant or nearly absent. Lymphoid tissue is frequently present to a very marked extent, and bears some relation to malignant deposits, as will presently be shown. Fat sometimes abounds in the subcutaneous connective tissue, which is frequently of an embryonic type, though often quite firm, fibrous, and well developed. This tissue very frequently contains hyaline cartilage and bone; of the latter I have spoken already. The cartilage may form small bodies like ivory pegs, liable to be taken at first for teeth, or else may protrude from the rest of the dermoid structures as a knob or tubercle, only invested by perichondrium, as though it had forced its way through the epidermis or mucous membrane, under which it had developed.

Deep in these dermoid growths numerous cystic and tubular structures are often found, and they present an infinite variety of type. Some, lined with very large columnar cells, are in every respect similar to small glandular ovarian cysts. Others simulate pharyngeal and other mucous glands. I have seen in one case a considerable collection of nerve tissue, including medullated fibres and ganglion cells of varying sizes, some large and well formed. Plain muscular fibre is also frequent; I have never seen the striated variety in a dermoid ovarian growth. Vessels of all kinds often abound, the arteries have thick walls and do not appear to rupture easily; indeed, collections of extravasated blood generally denote hæmorrhage within a thin-walled cyst, or the presence of sarcomatous material, as in a case which will presently be related. It is not surprising that so many tissues are found promiscuously in these cysts if they be really developed from an unimpregnated ovum, for nobody can doubt that the ovum possesses the germs of all tissues. The process of impregnation certainly differentiates some of the ovular elements, so that the tissues

of the fœtus may develop in their right places; this process does not play a share in the development of dermoid tumours, hence it is not to be wondered at that the natural relation of parts in the fœtus is not maintained. Whether a blastoderm develops without dividing into the three layers as in an impregnated ovum, I cannot say; it seems probable that the ovum may partly develop as far as the undivided blastoderm; if so, this would explain the origin of dermoid tumours.

The most interesting question with regard to dermoid cysts, and the most important clinically as well as pathologically, is the occasional occurrence of malignant new growths within their cavities. Mr. Thornton assures me that he has known several cases where malignant deposits have recurred in the pelvis two or three years after the removal of large dermoid cysts containing soft white growths that strongly resemble sarcomata. These growths, as in one case in my own practice, may occur in dermoid tumours where some of the most complex structures, as muscle and nerve cells and fibres, exist, as well as epidermis and its appendages.

In October 1883 I removed a dermoid ovarian tumour from a girl aged seventeen; the clinical features of this case are related in the chapter on twisting of the pedicle. The tumour was multilocular; one large cavity was filled with greasy chocolate-coloured fluid mixed with soft clot; many of the secondary cysts held broad, thin, and flat bony plates, masses of sebaceous material, skin and hair, and some soft, very suspicious-looking substance. Some microscopic specimens of great beauty were prepared for me by Mr. Lyndon and Mr. Francis in the physiological laboratory at St. Bartholomew's Hospital. Some of these were from portions of solid growth clearly epidermic, yet including soft white growths; others were cut through the indistinct line of demarcation between the epidermic and deeper structures and the soft, almost diffuent, white growth which filled some of the secondary cysts, and which I had suspected to be sarcomatous. This soft growth was full of small prickles, which were in reality very fine bony spicula, and there were numerous hæmorrhages into its substance.

The epidermic and other structures in the firmer part of the tumour included hair, sebaceous and sudoriparous glands,

fat, fibrous tissue, plain muscular fibres, bone, cartilage, and nerve* cells. Towards the soft white growth there was abundance of connective tissue which passed gradually and without any sharp line of demarcation into the soft material which consisted almost entirely of round cells

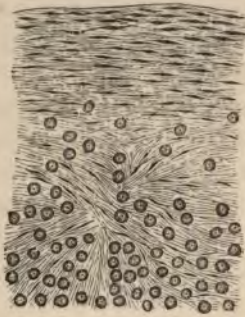


FIG. 18.—ROUND-CELLED SARCOMA FROM A DERMOID CYST, showing the transition from the connective tissue of the firmer portion of the tumour to the collection of round-cells, with a trace of fibrillation of the intercellular substance in the softer part of the tumour.

(fig. 18); near the well-formed connective tissue many connective tissue corpuscles passed between the cells, but in the deeper and softer part of the growth nothing could be found but round cells and a granular, very transparent matrix. In fact, this was a sarcomatous growth; I took care to distinguish it from collections of leucocytes in other parts of the tumour where hæmorrhage had occurred.

Only one month later I assisted Dr. Bantock at an operation where a dermoid cyst was removed from a young woman aged twenty-two. The cyst was multilocular, and the smaller

cysts contained much dermoid growth, including hair and teeth; there were bony spicula and a large knob of cartilage. In the midst of one of these growths were two large tuberosities the size of small potatoes, and composed of dark-red, firm, fleshy material, not so soft as in my case. Some fine sections of this were prepared by Mr. Lyndon and Mr. Francis. At first, parts of the sections appeared to show abundant lymphoid tissue, but the fibrous network with leucocytes evidently represented the hæmorrhage which had caused the growths to be stained of a deep red colour almost throughout; indeed, the transition from recent clot to this condition of leucocytes lying in meshes of fibrine could readily be traced. But in the paler portions very abundant connective tissue was found; it was in parts well developed, but mostly embryonic. Large spindle-cells and collections of round cells abounded.

The relation between the connective tissue of a dermoid cyst and sarcomatous growths within the same cyst is, it may reasonably be presumed, the same as the relation between the

same tissue and the same forms of morbid growth elsewhere. Considering, however, the abnormal conditions of a dermoid tumour, it is not wonderful that many of its tissues should exhibit aberrations of histological structure. With regard to growths that are included amongst innocent tumours, growths composed of normal cartilage, bone, fibrous, and even glandular tissue, it is impossible to determine their existence as such within the cavities of a dermoid cyst, for is such a cyst to be described in homologous terms, as regards general pathology, as a mass of enchondromata, exostoses, fibromata, adenomata, and so on? This appears illogical; and if such a description be true, we must invent the terms *seboma*, *sudoriparous-gland-tumour*, and employ much more

English cut on Greek and Latin
Like fustian, heretofore, on satin.

The formation of perfect skin, epidermic appendages, and adipose tissue, is clearly something not identical with the formation of tumours. But it cannot be determined where bone or cartilage may grow in the tissues of a dermoid tumour as a natural part of the peculiar process whereby such tumours form, and where bone or cartilage may grow within a dermoid tumour as an exostosis or enchondroma within such a tumour. Where epithelium should or should not be is also a question well-nigh impossible to solve, when we contemplate the multitude of sebaceous and sudoriparous glands, and structures resembling pharyngeal and other glands, not excluding cysts of the multilocular ovarian type, all of which may be found in a square inch of solid growth from a dermoid cyst. Hence it is very difficult to venture a decision on any quasi-cancerous tissue in cysts of this kind.

With regard, however, to the sarcomata, these growths are considered to be made up of more or less embryonic connective tissue. In dermoid cysts connective tissue exists in all its stages of development, and the last two examples which I have described show that the perfect tissue may be seen passing into less well-developed structures, bearing every resemblance to the new growths known as spindle-celled sarcoma and round-celled sarcoma elsewhere. What is far more serious is the fact that

experienced clinical authorities declare that dermoid cysts, with ill-developed tissue of this kind, give rise to all the worst results which follow the development of sarcomata elsewhere, so that it is, pathologically speaking, not illogical to speak of sarcoma of a dermoid cyst as a tumour of a tumour. The abundant connective tissue of a dermoid cyst is a natural and necessary feature in such a cyst, and from it sarcoma may develop, just as that morbid growth may grow from the natural connective tissue of previously healthy parts of the human body. By analogy, then, we may proceed further, and say that some of the large knobs of cartilage which are found, but not as a rule, in dermoid cysts are enchondromata within those cysts. These knobs tend to ossify, and the consequence would be, under the same theory, an osteoma or exostosis of a dermoid cyst; but the large dentigerous plates of bone, whether simulating the alveolar part of the maxillæ, or consisting of osseous tissue denser than the petrous portion of a temporal bone, are clearly a result of the primary influence which causes a dermoid tumour to form, for no exostosis away from the jaws has ever been found to develop teeth. I have avoided throughout this chapter the word *teratoma*, as it is merely a term covering ignorance, and liable to mislead the pathologist.

CHAPTER VI.

SOLID TUMOURS OF THE OVARY.

I HAVE been present at twenty operations for the removal of solid tumours of the ovary, and in one case the tumour was evidently a hard cancer. Sarcoma or carcinoma of the ovary involves numerous questions of great clinical and pathological interest. Firstly comes diagnosis from pregnancy, and from fibroid or rather myomatous tumours of the uterus; then the justifiability of operations; then the clinical aspects of the relation of sarcoma of the ovary to cystic ovarian tumours that have become partly solid through intracystic glandular or papillary growths, and to solid or partially solid dermoid tumours. Lastly, there are more purely pathological questions, the first of which is the nature of ovarian sarcoma and its relation to the histology of the healthy ovary; and this leads to general problems concerning the relation of any tumour in any part of the body to its surroundings, especially as regards its origin.

The general features of diagnosis need not be dwelt upon, nor discussed in detail, as they are to be found in almost every text-book and standard work on diseases of women. The very frequent presence of ascites and the softness of many sarcomata, that often contain large cysts, are common sources of difficulty. In suspected pregnancy there is the placental souffle and the foetal heart to be sought, and the other signs of this condition to be noted; lastly, a little waiting must settle all. The diagnosis of ovarian sarcoma from soft subperitoneal myoma of the uterus is often a matter of very great difficulty, and in some cases—as when a large solid pelvic growth causes anasarca of the lower extremities from pressure, emaciation, and other unfavourable symptoms—the truth cannot be learnt till the abdominal walls have been opened by the surgeon. The

symptoms of advanced malignant disease of this kind are very evident, and there is now no doubt that the surgeon is justified in removing a solid tumour if he find, in the course of an exploratory operation, that it is ovarian. Dismissing the question of hysterectomy, in case the tumour should prove to be uterine, I may here remark that, as far as my experience extends, the risk of exploratory operations under the above circumstances is very slight, even when removal of the tumour is found to be impracticable. I have witnessed fourteen true exploratory operations where nothing could be removed, in three of which the tumour was found to be uterine—none of these cases died; in a fourth, pregnancy and cystic ovarian disease were suspected, but it proved to be a case of cystic myoma of a pregnant uterus; the patient was afterwards delivered at full term. In one case, sarcoma of the liver was discovered after several quarts of ascitic fluid had been removed; the patient recovered. In another, several suppurating hydatids, projecting from below the liver, were detected; they were drained, but the patient died. In another case a singular condition of peritonitic adhesions existed, but no tumour could be found; the patient recovered. In three there was extensive papillomatous disease of the broad ligament; one was drained, and died with very acute septic symptoms; the other two recovered perfectly from the incision. One other case was a broad ligament cyst which could not be removed, owing to deep pelvic connections; it contained no solid growths. Its main wall was opened and stitched to the edges of the abdominal wound after several pints of fluid had been let out; the patient made a good recovery. In the three remaining cases disseminated malignant disease of the ovaries was discovered; the parietal peritoneum was found infected in at least two, but all recovered from the operation; nor was there any failure of union in the abdominal wound.

Thus the risk of an abdominal operation is not great, and a sarcoma of the ovary, even when disseminated, tolerates interference of this kind far better than papillomatous cysts, which bleed very severely at the least touch. Should a solid tumour of the ovary be suspected, it is the duty of the operator, unless there be signs of pelvic deposit and other evidences of dissemination of malignant growth, to make an exploratory incision.

If the diagnosis prove correct, and a fair pedicle exists, the tumour may safely be removed. A sarcoma of the ovary, if left alone, is certain to cause secondary deposits and death, after months of great misery to the patient. When removed, it certainly does not tend to recur as rapidly as a sarcoma in other parts of the body. Wells and others have had numerous cases where recurrence was delayed for years, or indefinitely.

The microscopical appearances of solid tumours of the ovary now demand consideration. The tissues of the normal ovary must be clearly understood, the observer never losing sight of the fact that he must take into account, not only the connective-tissue framework and the unstriped muscular fibres, but also the cellular and tubular relics of the Wolffian body in the hilum, the thick-coated blood-vessels, and the follicles in all their conditions, whether as corpora lútea, as structures that have undergone retrograde changes without ever becoming corpora lutea, or as normal follicles, large or small; nor must the colloid changes in the stroma be overlooked, whatever may be their nature and origin.

Of the follicular and Wolffian element I have spoken elsewhere; as to the stroma, it is convenient to quote the words of Dr. Klein in his excellent 'Elements of Histology.' I have italicised the names of structures which are particularly important for the present question:

'In the part of the ovary next to the hilum there are numerous blood-vessels in a loose *fibrous connective tissue*, with numerous longitudinal bundles of *non-striped muscular tissue* directly continuous with the same tissues of the ligamentum latum. This portion of the ovary is the zona vasculosa (Waldayer). All parts of the zona vasculosa—i.e. the bundles of fibrous connective tissue, the blood-vessels, and the bundles of non-striped muscular tissue—are traceable into the parenchyma. The stroma of this latter, however, is made up of bundles of *shorter* or *longer* transparent and *spindle-shaped cells*, each with an oval nucleus. These bundles of spindle-shaped cells form, by crossing and interlacing, a tolerably dense tissue, in which lie embedded in special arrangements the Graafian follicles. Around the larger examples of the latter, the spindle-shaped cells form more or less concentric layers. In the human

ovary bundles of *fibrous tissue* are also met with. The spindle-shaped cells are most probably a young state of connective tissue. Between these bundles of spindle-shaped cells occur cylindrical or irregular streaks or groups of polyhedral cells, each with a spherical nucleus; they correspond to the interstitial *epithelial cells* mentioned (*sic*) in the testis, and they are also derived from the foetal Wolffian body.

Hence we are assured, on the authority of a distinguished and experienced histologist, that the ovary contains elements in its framework alone, putting aside the follicles and the blood-vessels, whence fibroma, sarcoma, myoma, or cancer may develop. I may add that I have found that the ligament of the ovary is a great conductor of the influence, whatever that may be, which sets up the formation of a myoma in the uterus or in the ovary; or, to speak more plainly, that ligament is often very much thickened in cases of myoma of the uterus; and when the same form of tumour attacks the ovary first, I have frequently found hypertrophy of the muscular substance of that ligament, involving the portion of the uterine wall that it joins.

In old museum specimens of 'fibrous tumours' of the ovary, I have found, as might be expected, that many were sarcomata, whilst others were clearly myomatous. Klein's 'numerous longitudinal bundles of non-striped muscular tissue' are not only 'directly continuous with the same tissues in the ligamentum latum,' but also with the same tissues in the ovarian ligament; and when a myoma exists, and the junction of the ligament with the tumour is examined, long lines of muscular fibre-cells may be seen running from the direction of the ligament, and spreading out widely amongst the precisely similar cells in the substance of the tumour. This condition, which is by no means rare, is most successfully to be sought for in cases of multiple myomata of the uterus, where the ovary is tough and slightly enlarged—involved, in fact, in the new growth.

The origin of solid ovarian tumours of the type of each tissue is, in all probability, due to the same causes as in other organs, and these causes involve questions too wide and too general for discussion in these pages. I must, however, refer to hæmorrhages within the ovarian substance, whether confined to, or taking place beyond, the limits of a follicle or corpus

luteum ; that coagula may become sarcomatous is as probable in the ovary as elsewhere. Here, as in other cases, the pathologist must be certain that the hæmorrhage is not secondary to a minute deposit of sarcomatous tissue, including the usual thin-walled vessels so liable to rupture.

I have never found a solid ovarian tumour to be formed of pure fibrous tissue, and strongly suspect that the 'fibroids' of the ovary are identical pathologically with 'fibroids' of the uterus. All the solid tumours that I have seen removed at operations have proved to be sarcomatous or cancerous. But in 1879, when working in the Museum of the Royal College of



FIG. 19.—MYOMA OF THE OVARY.

Surgeons, I examined and mounted a specimen of a tumour of the ovary which bore the microscopical characters of a myoma. It was presented by Sir Spencer Wells, and is represented in this sketch (fig. 19). It was removed by the donor from a single woman aged sixty-eight ; she had observed it for over eight years. An abdominal incision, ten inches long, was necessary before it could be drawn out of the patient's body ; it had a good pedicle, easily secured, and the ovarian ligament was very thick. The patient made a good recovery, and was quite well in 1884. When first removed, the tumour weighed 15 lbs. 2 oz. The Fallopian tube and the broad ligament were perfectly free from disease. The circumference of the tumour

was thirty-one inches; its vertical measurement seven and a half inches; from right to left it measured nine and a half inches, and antero-posteriorly nine inches. Its anterior surface was tolerably regular; its posterior was divided by a deep depression into two large tubercles, and the ovarian ligament, connecting it with the uterus, was much enlarged. On section, its surface appeared of a uniform white colour, with a pattern produced by innumerable bands of wavy and interlacing fibres; the substance of the tumour was extremely tough, as resistant as in the firmest uterine 'fibroids.' On microscopical examination, I found that it bore the very closest resemblance to sections from uterine 'fibroids,' and from ovaries involved in uterine disease of that kind. There was very little true connective tissue to be found in the entire tumour, and that which existed appeared to be histologically well developed.

In spindle-celled sarcoma of the ovary, I have never found the ovary nearly as firm as in the above case of myoma. There is a very close relation between this kind of sarcoma of the ovary and the hypertrophy of the stroma, not rare in an ovary the fellow of which is involved in cystic disease, also in cases of atrophy of the follicles in healthy young sterile women and in other allied conditions. This true hypertrophy of the stroma must be distinguished from the changes seen in congestion and cirrhosis of the ovary, but it is hard to distinguish from true sarcoma. I have sections of a right ovary that was three inches in diameter, two ounces in weight, and very succulent in texture; it contained hardly a trace of any follicles; its fellow was a large multilocular cyst. These sections closely resemble those taken from the specimen next to be described. The normal spindle-cells were simply further apart than in a healthy ovary, and the intercellular substance was more abundant.

The transition from this condition to the commonest form of sarcoma of the ovary is readily understood on microscopic examination of sections of new growths of this kind. The appended drawings illustrate the microscopic appearances of sections of a large solid tumour removed by Sir Spencer Wells from a young woman in May 1880; the patient was in good health two years later. It was almost entirely made up of small spindle-cells, very

far apart, with abundant intercellular substance, consisting of very fine fibrils and numerous thin-walled vessels. The intercellular substance was obscurely fibrillated in the middle and softer parts of the tumour, but near the surface white fibrous

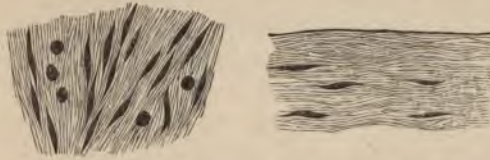


FIG. 20.—SPINDLE-CELLED SARCOMA OF THE OVARY, showing the superficial and the more central part of the tumour.

tissue was abundant, and the close relation between the cells and the fibres was evident (fig. 20). A few round cells were seen, exclusive of spindle-cells cut across transversely; also some larger cells with large nuclei, probably of Wolffian origin. In this case the tumour may be considered as simply a hyperplasia of the young connective tissue that naturally exists in the ovary. It is the most frequent form of sarcoma of that organ.

Other forms of sarcoma are frequent, and I have seen and examined specimens which differ from the above typical form in greater predominance of the cells, but many more where the intercellular substance was much increased. In a section of an incipient and tolerably firm sarcoma of the right ovary I found that large round cells were very abundant. The opposite ovary was converted into a large solid tumour, and both were removed, from a patient aged forty-five, by Mr. Thornton in December 1881. Fig. 21 represents the right ovary itself; it was hardly of the normal size. The sarcomatous substance, though firm for a sarcoma, was much softer than that of a pure spindle-celled sarcoma of the ovary, and bore no resemblance to hypertrophied ovarian stroma. The patient made a good recovery.



FIG. 21.—ROUND-CELLED SARCOMA developing in a small Ovary.

In another case of sarcoma of both ovaries, under the care

of the same surgeon, where rupture of a multilocular cyst with hæmorrhage had been diagnosed, it was found, on opening the abdominal cavity, that several pints of old blood had escaped from the right ovary, which had become an exceedingly soft tumour, the size of a lemon, and closely adherent to the side of the pelvis. The left was about the same size, and so dark that I thought it must be melanotic, but the colouration proved to be due to extravasated blood, not a trace of true melanotic pigment being present. Both tumours were removed, and the patient, a woman aged twenty-six, recovered from the operation.

The right tumour was much broken down; the left was less affected, but was very soft, quite of the 'encephaloid' type, and no patches of mucoid tissue were visible to the naked eye. On microscopical examination, it proved to be a mixed sarcoma. The round cells predominated, excepting at a few points where the sections closely resembled those of the case of spindle-celled sarcoma mentioned in this chapter. In the softer parts there were large clusters of round cells, and the microscope revealed several areas of mucoid tissue with characteristic branched cells.

In another case, under the care of a colleague, the tumour had all the microscopical characters of alveolar sarcoma. The patient was a married women, aged twenty-five. A solid elastic tumour of several months' growth filled the hypogastrium; the uterus was apparently free from it. To the touch it felt like a pedunculated uterine myoma or a dermoid ovarian tumour. At the operation it proved to be a solid ovarian growth; the pedicle was extremely vascular, but not very hard to secure; some large veins on its inner limits were ligatured separately, as were the outer vessels, on the usual plan. Transfixion of the entire pedicle was managed without causing hæmorrhage, as the large veins could readily be pushed apart by the fingers before the needle was introduced. The left ovary formed a small sarcomatous mass three inches in diameter; it was removed. The patient did well till the twenty-third day, when the temperature rose to 106°, and she died three days later. No necropsy was allowed; death appeared to be due to acute peritonitis set up by some secondary malignant deposit.

Some sections were carefully prepared for me at the Royal College of Surgeons by Mr. F. S. Eve. Fig. 22 shows the appearances of a section. The tumour was made up of large round cells, collected in groups, and lying in the spaces of a network of fibres, with which they appeared to be very intimately connected; fibres, too, could be distinctly seen passing between individual cells.

This specimen may be instructively contrasted with a case of scirrhus to be described farther on. Mr. Butlin, Mr. Eve, and myself, after careful examination of this tumour, have all arrived at the same conclusion as to its nature.



FIG. 22.—ALVEOLAR SARCOMA OF THE OVARY.

In a case which I saw in August 1882 with Sir Spencer Wells, the nature of the tumour was a little doubtful. The patient was a girl aged sixteen, who had been under the care of Mr. Conolly, of Wood Green. She had never menstruated, and her friends had noticed that she had been growing larger for twelve months; emaciation was progressing rather rapidly. I found the abdomen distended by an elastic and obscurely fluctuating growth, extending for two inches above the umbilicus; there was resonance on percussion both in the flanks and the epigastrium. Two or three stationary hard bodies could be felt on the surface of the tumour. In the following autumn, the patient grew rapidly worse, and, in January 1883, Sir Spencer Wells removed the tumour with my assistance. Seven pints of fluid were removed, and the solid mass separated with difficulty from adhesions to the parietes, intestines, omentum, and liver. The patient recovered perfectly, and was in excellent health eighteen months after the operation.

The tumour was a large soft mass, weighing fourteen and a half pounds. On section it appeared to be chiefly what would once have been termed a 'fibro-cellular growth'—that is, it was made up of a dense network of white fibres, the interstices between which were filled with semi-opaque material.

The microscopical appearances (fig. 23) proved to be rather puzzling. A stout network of connective tissue, bearing scanty but characteristic nuclei, inclosed a great number of oval or circular cavities, which bore traces of a semitransparent material that had for the most part dropped out of these cavities, probably during the process of section. In the midst of the connective-tissue network were many semitransparent patches quite distinct from the cavities. On examining the section under a higher power, I failed to find a trace of any regular epithelial lining to the cavities, but the semitransparent patches contained large cells that were undergoing some form of degeneration of a hyaline character, but not that which is so characteristic in colloid cancer (fig. 24). In some the nuclei

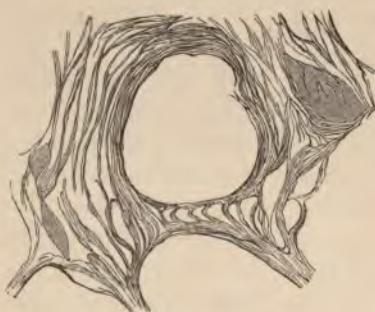


FIG. 23.—TUMOUR OF OVARY,
of uncertain nature.



FIG. 24.—THE SAME TUMOUR as in Fig. 23,
as seen under $\frac{1}{8}$ -inch objective.

were plainly visible; in others the outline was indefinite, so that they appeared as though smudged or blurred over each other. The connective-tissue nuclei in the surrounding stroma were very distinctly seen under a $\frac{1}{8}$ -inch objective. Altogether it would seem that this tumour was a simple hypertrophy of the connective tissue of the ovary. The characters of the epithelium bore no resemblance to any normal epithelial elements of the ovary, but some remote relation may perhaps be traced to those of Graafian follicles in the strong tendency to degeneration which they exhibited. Probably this tumour was a peculiar form of adenoma; the subsequent history of the case, the patient being now (April 1884) in excellent health, is against sarcoma and carcinoma.

The following case was undoubtedly an example of cancer of the ovary. In March 1881, I was present at an operation where a very large solid tumour was removed by a colleague from a girl aged fifteen.¹ It was an oval mass cutting, and cupping on section, precisely like a scirrhus of the breast. Its cut surface was dull-yellow and fibrous-looking; in the centre was a large area of mucoid tissue, and close to it a bright yellow patch, cutting very grittily. The patient sank from exhaustion within forty-eight hours of the operation.

On microscopical examination, all the characters of hard cancer were found to be strongly marked (fig. 25). The drawings sufficiently show the nature of the growth, the

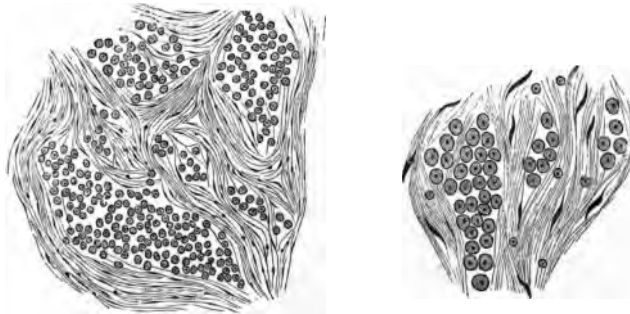


FIG. 25.—CANCER OF THE OVARY. (2-inch and $\frac{1}{8}$ -inch objectives.)

intercellular substance was a very dense framework of connective tissue with characteristic corpuscles; the cells were closely packed in the alveoli formed by the framework. This case may instructively be compared with the example of alveolar sarcoma (fig. 22) already described. There, the intercellular substance was delicate and very intimately connected with the cells, amidst which it sent delicate processes. In this case of cancer the intercellular substance was abundant and coarse, and quite separate from the cells which were tightly packed in the alveoli.

¹ For a full account of the clinical features of this case see 'Solid Ovarian Tumours,' by J. K. Thornton, *Medical Times and Gazette*, vol. i. 1883, p. 211.

I have not since come across a precisely similar case. The malignant deposit, not unfrequent within multilocular cysts, is, as far as I have observed, either true colloid cancer, or else what may vaguely be described as adeno-sarcoma, it being hard to distinguish how far the glandular or the sarcomatous elements prevail. The question of malignant dermoid cysts is discussed in the chapter on dermoid tumours of the ovary.

CHAPTER VII.

RUPTURE OF OVARIAN CYSTS.

RUPTURE of an ovarian cyst is an important complication, to be considered both from its clinical and its surgical aspects. Its symptoms and prognosis demand careful study; the treatment often bears upon the question of the justifiability of ovariectomy in cases in a desperate condition, and the allied problem of early operation in cases of ovarian tumour is ever associated with the desire on the part of the surgeon to save the patient from the risks of this complication.

Prolonged experience in ovarian surgery tends to prove that rupture of the cyst is, as a rule, a mere leakage, producing but a slight amount of discomfort, and very trifling symptoms of peritoneal irritation. A patient will often state, as a part of the history of her illness, that she woke up on one occasion, and found she was much smaller. On the other hand, a clear history of rupture, with no subsequent acute symptoms, may be followed by ascites, cachexia, and other signs of a disseminated new growth in the abdomen. Lastly, we must consider the true acute rupture of an ovarian cyst, followed by fatal hæmorrhage or peritonitis.

These varieties of the complication depend greatly upon the nature and cause of the rent or aperture in the cyst. The giving way of a secondary cyst through the main wall of a tumour, or the leakage of a large cyst through that wall, produce very mild results, provided that the fluid poured into the peritoneum be free from inflammatory, septic, or malignant elements. Rupture of a cyst wall through the overgrowth of a solid intracystic formation is not likely to be immediately followed by serious symptoms, as the effusion is checked by the growth which stops the leak, but the risk of malignant infection

of the peritoneum is very great. It is hardly necessary to say that traumatic rupture of a cyst, or spontaneous rupture of an inflamed or gangrenous cyst, is a very grave matter. This latter and best-recognised variety of the complication in question may be put aside till treatment is considered. Any tightly distended cyst may burst, if struck hard enough, or if it softens through pathological changes.

The leakage or less acute rupture of a cyst is an interesting pathological study, which throws much light on certain clinical questions. In a very large proportion of the common multilocular ovarian cysts which I have examined, I have noticed, as many others must have noticed, how the main wall is thinner at certain points than at others. Putting aside the appearances of thinning through inflammatory degeneration or blocking of vessels, for the present, I will presently dwell for a time on the thinning from mere distension—far more common, by the way. On opening the tumour, the thin, transparent, or semi-transparent patches will be found to correspond with secondary cysts pressing against the main wall. Very often such cysts are seen bulging from that wall, the moment that the abdominal cavity is opened by the operator, and not unfrequently they are burst in the process of extraction of the cyst through the abdominal wound. But before discussing pathological details any further, I will speak of the clinical experience on which my observations are founded.

In the wards of the Samaritan Hospital, I have seen twenty-nine ovariectomies where the cyst had previously been ruptured. I exclude from this category all cases of rupture of the cyst during operation, a frequent occurrence which includes rents in the main cyst wall produced by dragging on the tumour when collapsed after its fluid contents have been emptied, rupture of weak or gangrenous parts of a cyst wall during operative manipulations, and the perforation of the posterior part of a cyst by the finger of the operator, an accident that may occur when the solid contents of a tumour are being broken down to facilitate its extraction. All these conditions appertain more to purely operative details than to the present subject.

When an uninfamed cyst has ruptured or leaked, and the

operation is performed a very short time afterwards, the appearances seen when the abdominal cavity is first opened are very characteristic, and may puzzle an inexperienced surgeon. The thin stretched peritoneum, with numerous fibrous bands crossing it and with its vessels dilated through incipient inflammatory changes, sometimes looks like the surface of the large intestine. It can generally be pressed against the surface of the cyst, and then a puncture with the point of the scalpel will let out the fluid and expose the cyst. As the opening of the abdominal cavity destroys for the time the mutual pressure of its contents, the ruptured cyst immediately begins to empty itself of the remainder of its contents with considerable rapidity if the rent in its wall cannot be secured in time.

I will now relate all that transpired at the operations where a previously ruptured cyst was removed, including the public observations of the operator and the appearances of the structures concerned in the operation. The previous history of the cases, and other details not bearing on the present question, are, of course, the property of the operators. I write this, not only in accordance with the principles on which this work is composed, but also to remind the reader that a previous history of rupture existed in the majority of the twenty-nine cases.

In four of the cases, however, the history was remarkably clear and instructive. A woman aged forty-five had been troubled for years with an enlargement of the abdomen, which suddenly disappeared spontaneously, but the patient's size rapidly increased again, the abdomen was tapped, characteristic ovarian fluid was drawn off, and after a few months a large ovarian tumour with one predominating cyst was removed. There were only a few parietal and omental adhesions, and the operation terminated favourably. In another case there was a history, on good authority, of great reduction in the size of a cyst, but no cicatrix could be found; the tumour was a dermoid cyst with a very irregular outer surface, and the cicatricial tissue might well have been effaced or concealed by thick fibrous tissue which lay in the sulci between the numerous tuberosities on the surface of the cyst. There was very little peritonitis. In a third case a woman, aged thirty-nine, had a

fall, and immediately observed a reduction in the size of her abdomen. Very little pain followed, and at the operation the tumour was found to be a simple broad-ligament cyst. The fluid contents of a growth of this kind have long been known to be devoid of irritating qualities, as far as the peritoneum is concerned. In many broad-ligament cysts bearing papillary growths the fluid is very similar, but the results are far different, as will be shown presently. Hence, if rupture of the so-called parovarian cyst (and I retain the conventional name, to avoid confusion, as stated in the chapter on broad-ligament cysts) be diagnosed, operation should not be delayed, for the simplest cyst of this class sometimes contains a few papillomatous growths, which will entirely alter the prognosis.

In a fourth case, there was a clear history of rupture, a few years before operation. At the operation a large parovarian cyst was removed; in its walls a very distinct cicatrix was found, with its tissue partly calcified. This forms a preparation now in the Museum of the Royal College of Surgeons, to which collection it was presented by the operator, Mr. Thornton. (Pathological Series, No. 4505.)

Passing to the immediate results of rupture, in four very acute peritonitis existed, and in ten there were objective evidences of chronic peritonitis. In one of these cases acute pleurisy followed rupture, and the pleura was tapped. The peritoneum was intensely injected, but all bad symptoms disappeared after the removal of the tumour, which was an almost sessile multilocular cyst. The case bears a certain analogy to the curious example of papilloma of the Fallopian tube, related in another chapter.

On the other hand, a sickly and timid young woman, under the care of Dr. Bantock, had consulted that surgeon for abdominal swelling and jaundice. The swelling suddenly diminished in size, but the patient suffered no consequent pain. The tumour was tapped a few weeks before operation. When ovariotomy was performed the pelvis was found to be full of clear, glairy, ovarian fluid, and there was a rent at the lower part of the cyst three and a half inches in diameter, and its margins were well healed. The tumour was a large multilocular cyst of the right ovary. There was one pelvic adhesion, but none

between the cyst and the parietal peritoneum. The abdominal cavity was sponged out with plain warm water, and the patient made a good recovery. In the cases of ruptured colloid cysts which I have observed, peritonitis invariably existed; the omentum, when bathed by colloid fluid for a prolonged period, becomes very much thickened, and looks like a mass of boiled sago with small blood-vessels running over it. This condition, in particular, gives the peculiar feeling, on palpation, which Olshausen terms *colloidknittern*. He considers it as pathognomonic of ruptured colloid cysts, but I have found that it is by no means invariably present.

One of these colloid cases was very remarkable. The patient was a healthy woman about thirty-five years of age; a tumour had been observed for several years, and shortly before operation she had suffered from pains in the pelvis. The tumour was not well defined; it pressed upon the body of the uterus, which was thus pushed forwards in the pelvis. At the operation, when the peritoneum was exposed, a quantity of free material could be seen through it. On laying open that serous membrane, several pounds of free colloid material escaped, or were removed by the hand of the operator, and the cyst was found to be widely rent, with exceedingly soft walls, and with a deep pelvic adhesion. The peritoneum was found to be intensely injected wherever it was exposed; yet, notwithstanding the extreme degree of extravasation of colloid material and these objective evidences of peritonitis, the clinical symptoms of that disease were absent. The pressure of a prolongation of the cyst into the pelvis, to which it adhered, was the cause of the pelvic pain. The patient unfortunately died on the tenth day; there was broken-down malignant deposit in Douglas's pouch.

Gangrene and consequent rupture of an ovarian tumour is generally associated with twisting of the pedicle, but I have seen one case where the tumour gave way two days before operation, when it was found to be a large multilocular growth, with a rent in front, through tissue in the outer wall that appeared to be in an incipient state of gangrene, but the pedicle was not twisted. Acute peritonitis, without purulent exudation, but intense in degree, existed, and the patient died within twelve hours. It must not be supposed that the abdominal

structures are thrown into relief, and thus made more readily distinguishable from each other by the vascular changes in acute peritonitis; on the contrary, the surfaces of the intestines, bladder, uterus, and parietal peritoneum lose their natural differences of tint and shininess or dulness of surface, and the matting together of the uterine appendages in the neighbourhood of the cæcum, sigmoid flexure, and rectum, greatly embarrass even experienced operators; nor is such a case easy when no adhesions or extensive effusion exists, as in the instance first mentioned.

A multilocular cyst often bursts posteriorly, secondary cysts projecting, in a manner presently to be described, through the main wall, and rupturing into Douglas's pouch; frequently in such cases but little peritoneal irritation is set up. I once assisted Dr. Bantock at an operation on a patient aged twenty-one, where a large multilocular cyst was removed; there was a distinct history of diminution in size, with a sensation of something having given way, but there had been very little extra abdominal pain. On opening the abdominal wall, the thin, stretched peritoneum, with numerous fibrous bands crossing it, and with clear blood-stained fluid behind it, looked like a piece of inflamed distended intestine. On puncturing the serous membrane, a quantity of the blood-stained fluid escaped, and the shiny white outer wall of the cyst came into view. The cyst was tapped, and, on drawing it through the abdominal wound, its posterior wall was found to be very thin, and it had yielded at one point. The free fluid appeared to be partly ascitic. There was no further complication; the pedicle was not twisted; a drainage-tube was inserted into Douglas's pouch, and the patient made a good recovery.

The staining of the fluid in this case leads to the subject of hæmorrhage, another source of danger after rupture of a cyst. As a rule, hæmorrhage is but slight, especially in the typical instances of rents in thinned parts of the outer walls of cysts, where the degeneration of those parts is often due to blocking of vessels. If a rent or circular aperture communicate with the interior of a large cystic cavity lined with very vascular walls, especially when vascular solid growths are present, the walls of the vessels lose their support, and hæmorrhage occurs. This is

very often seen when the tumour has been emptied in the course of the operation; the bleeding is seldom rapid under such circumstances, although, of course, the surgeon should secure the pedicle as quickly as possible. It is evident, on the other hand, that when bleeding is caused by rupture of a cyst, it may in a few hours amount to a serious loss of blood. I assisted a colleague two years ago at an operation upon a woman about thirty-five years of age, who had entered the hospital with an ovarian tumour, and was seized with acute bronchitis in the ward. After a fit of coughing she became reduced in size, and the cyst became flaccid; the patient then grew more and more anæmic every day. On opening the abdominal cavity, the appearances were much as in the last case, only the free fluid was much more deeply blood-stained. The rent in the cyst was blocked by a secondary cyst in a manner presently to be described. The tumour was sessile, and extremely difficult to remove; the operation—imperative, considering the symptoms—was performed under very unfavourable circumstances, and the patient died on the fourth day. Comparing this with the last case, and both with some other cases in this chapter, where either no other complications, or other complications of the gravest nature, existed, it is evidently futile to attempt to make statistical inferences, and to calculate the proportion of mortality in a collection of cases of rupture of ovarian cysts.

Cysts containing papillomatous growths are particularly liable to rupture. In another chapter the origin and nature of these growths are discussed at length. When they occur in mixed tumours, alongside of other cysts containing glandular contents—in tumours, that is to say, that arise partly from the parenchymatous stroma, partly from the tissue of the hilum—the walls of the secondary cysts whence they spring are often, at first, thick and tough; when they grow within true broad-ligament cysts the walls are often exceedingly thin. So rapid, in most cases, is the growth of these papillary structures that they can soon burst any cyst wall, thick or thin; but from their wedge-like or pyramidal form they tend to stop the leak that they make. This involves a far greater danger to the patient than the escape of fluid contents, especially in these particular cases, for the fluid is often clear and watery; nor when it is

mixed with blood from the growths, which are very vascular, does it always set up great peritoneal irritation. The growths themselves are very liable to infect the whole peritoneal cavity, exhibiting the most malignant tendencies. In a patient, aged twenty, where rupture had occurred a few weeks before operation, Mr. Thornton found a multilocular ovarian cyst, perforated at one point by a very large papillomatous mass. A large papillomatous growth had formed in Douglas's pouch, and the broad ligament also contained a papillary mass; but this latter was evidently part of the original disease, and not the result of the rupture. Cysts containing numerous thin-walled secondary cystic growths, with no solid contents, also tend to rupture, not through the pressure of the growths, but rather from thinning of the main cyst wall. The minute secondary cysts tend, after rupture, to reproduce themselves all over the peritoneum, especially upon the serous coat of the intestines, but do not then appear to be malignant; indeed, they seem as harmless as the small thin-walled broad-ligament cysts that form independently of relics of the Wolffian body in the immediate vicinity of the Fallopian tube. I observed this kind of infection of the peritoneum in a case under Mr. Thornton's care; the patient made a good recovery, and the disease did not recur.

There is apparently some relation between these secondary thin-walled cysts and the papillomatous growths. Into the wards of the same surgeon a patient was admitted in 1878, where a tumour existed with a clear history of rupture one year before operation. There was a hole in the cyst wall the size of a threepenny-piece, blocked up by a large protruding papillomatous mass, and the surface of the main cyst was studded with minute thin-walled cysts. Even the malignancy of the papillomatous growths is very uncertain. In Sir Spencer Wells's curious case of papilloma of the Fallopian tube, recorded in another chapter, there were several thin-walled pedunculated cysts amongst the papillomatous masses, and the peritoneum was bathed with discharge from the papillomatous growths, yet the patient was in good health four years after the operation. In cases where the disseminated papillary growths are of ovarian or Wolffian origin, the patient is not necessarily doomed; still, their dissemination over the peritoneum is a grave complication.

I have seen one case where the contents of a dermoid cyst were discharged into the bladder, and one where the fluid from the interior of a multilocular cyst emptied itself into the rectum, the contents being passed during defæcation. In both cases the operation was successful, but much complicated by adhesions. In these instances, indeed, it is rather a question of adhesion than rupture. An intimate primary adhesion between the cyst wall and the intestine may degenerate in such a manner as to set up a communication between them, or the irritation caused by a slight rupture may be the exciting cause of an adhesion of this class. The tissue which binds the adherent parts forms a conduit or tightly closed channel, through which the ovarian fluid may pass to an indefinite extent, not a minim ever entering the peritoneal cavity; and the constant irritation increases the production of organised inflammatory products which defend the peritoneum from the fluid. In short, in these cases the difficulty will ever lie in the separation of adhesions.

When a communication exists between a cyst and the bladder or intestine, it is most probable that a primary adhesion became the seat of communication. That, as stated above, the irritation caused by a slight rupture may set up an adhesion, followed by an aperture of communication, there can be little doubt, but this is probably the exception. Old adhesions between a cyst wall and the viscera tend to become degenerate, especially in the centre, and hence perforation is very probable. The subject of adhesions secondary to rupture is really a part of the subject of peritonitis from that complication. When the surgeon can confidently diagnose rupture, he must be prepared to find adhesions, and often they prove to be very intimate. Almost any complication in ovarian cystic disease increases the chance of adhesions. But, as nothing is certain in ovarian surgery, a very acute case of rupture, subjected to operation after all peritoneal symptoms have subsided, may prove—as in one instance, where I assisted a colleague—to be perfectly uncomplicated in all other respects, no adhesions existing. Such cases resemble those where subacute attacks of peritonitis worry the patient. The suffering enforces rest, and resolution of the inflammation takes place without the formation of organised

inflammatory products. The history alarms the surgeon, and, on opening the abdominal cavity, he is agreeably surprised to find that adhesions are entirely absent.

The actual nature of a rupture now remains for consideration. It may appear as a long rent, especially when caused by a blow or a fall; the largest cyst in a multilocular tumour is generally ruptured in such a case, and at the operation its walls are seen lying flaccid on the mass of smaller cysts behind and below it. The perforation caused by a papillomatous or even by a glandular growth is also to a great extent mechanical. The growth protrudes; its edges growing widely beyond the circumference of the aperture that it has made in the cyst wall. When this kind of perforation occurs in the front of the main cyst, the growth is often kept down for a time, and much flattened by the pressure and the movements of the abdominal walls, so as to appear, as in one case that I have seen, like the head of a nail that has been driven into the tumour. A leak is very frequently blocked up by an unruptured secondary cyst that has had no share in the injury to the main cyst wall, but has become approximated to the rupture, as that wall has fallen in after the escape of the ovarian fluid; I have seen this condition well marked in three cases. In such a case, the secondary cyst may become the largest and fullest cyst in the tumour; in fact, the same change occurs as after repeated tapping.

The pathological formation of a rupture by changes in the main cyst wall must be considered at length. It occurs through certain inflammatory and degenerative changes in the wall, and also from the pressure of secondary cysts developed more or less within the substance of the main wall. Local degeneration of the main cyst wall, independent of all changes resulting from the breaking down of secondary cysts, are very frequent, and the condition must be familiar to all who have read certain well-known British and foreign works on ovarian tumours. Wells describes the appearances of the inner aspect of the cyst wall at the seat of degeneration. This area is often several inches in circumference; its periphery consists of a zone of very vascular tissue; the vessels being large, engorged, and ruptured or blocked at certain points, much blood being

effused around the ruptured vessels. The centre of the area is of a very characteristic ochreous colour, becoming reddish-orange towards the periphery, and the wall is at this part very thin. The pathological significance of this condition is evident; the engorged vessels have been incapable of carrying nutrition to, or removing effete material from, the affected portion of the cyst, and the blood extravasated from the most distended vessels has undergone changes chiefly affecting its colouring matter, and hence the ochreous patches, which are homologous to the familiar hues of an old bruise on the integuments. The primary cause of the congestion may be inflammation of the wall, which often causes less extreme effects than those above described. Hence, in examining the inner aspect of a cyst that has inflamed, not only may these degenerate areas be observed, but also large patches of pure congestion without rupture or blocking of any vessels, and, on the other hand, small points of very anæmic tissue, where degeneration has ceased to extend, without having ever advanced to any great degree.

The breaking-down of one of these degenerate patches causes a rent, the margins of which are, from the very nature of the condition, thin from the first, and they tend to become thinner, the seat of rupture appearing after a week or two as a circular aperture from a quarter of an inch to over one inch in diameter. In some cases the irritation of the outpouring fluid causes inflammatory changes around the aperture, evidenced by hyperæmia most marked on the outer aspect of the cyst, or even by effusion and thickening. This condition is frequently taken for ulceration, but I believe the above interpretation to be the truth. I have examined several ovarian cysts, where more than one rupture existed. The most recent always appeared as a simple rent or a very small round hole in degenerate tissue; the hyperæmia and thickening lay around old apertures, some surrounded by peritoneal adhesions. When ulceration did exist, it was secondary to rupture. It is clear that when a cyst with an atrophied area becomes highly distended, it is liable to burst at that area without any previous ulceration.

What have been repeatedly taken for ulcers on the inner aspect of the main wall of an ovarian cyst are small secondary

cysts that have opened inwardly and are in process of effacement. This leads to the most frequent cause of rupture of a cyst, next to degeneration of its walls from vascular changes. In cutting through several inches of any main cyst wall, minute secondary cysts are generally to be found, and their nature has been discussed in Chapter II. These often enlarge indefinitely, and may burst externally; hence the small flaccid cysts frequently found on the surface of a large cystoma. Far more frequently they burst inwardly, discharging their contents into the main cavity; hence follows a very characteristic appearance on the inner wall of the main cyst. The ruptured secondary cyst



FIG. 26.—RUPTURED SECONDARY CYST on the inner aspect of the main wall of an ovarian tumour, in process of effacement. (Museum of Royal College of Surgeons, Pathological Series, No. 4504.)

appears at first as a circular depression with an elevated margin (fig. 26). The base is simply the vascular membrane that always lines the interior of secondary cysts, and it is invested with the usual columnar or cubical epithelium. It is very unlike the granular base of an ulcer. I have seen this appearance in an incipient multilocular cyst of the ovary, several

secondary cysts already being in course of destruction. The ruptured cyst does not long retain this appearance. Its elevated circular border becomes effaced by degeneration, and, when several secondary cysts have broken down together, as frequently occurs, an elevated, white fibrous patch is seen containing curious semicircular rings. This patch is made up of collapsed cyst walls; it simulates cicatricial tissue, and is very prone to degenerate and become the seat of rupture. But every intervening stage between this condition and immediate internal rupture of a secondary cyst may sometimes be seen in the same tumour.

In May 1884, I exhibited at the Obstetrical Society of London a specimen, where an unusual combination of circumstances had produced a remarkable appearance in the main

cyst wall. A secondary cyst had developed in the substance of the main wall distending the latter externally without causing rupture. On the other hand, it had ruptured internally. Hence a thin-walled digital protrusion two inches deep was seen on the outer surface of the tumour, whilst internally the protrusion could be seen to communicate with the cavity of the tumour by a circular orifice over an inch in diameter, surrounded by a very sharp fibrous ring of the kind usually seen at the seat of rupture of a secondary cyst when it bursts inwards. The tumour itself had ruptured at a point where another secondary cyst had formed in the main wall.

I must here refer to a case described by my friend and colleague, Mr. Meredith, where an ovarian cyst had ruptured repeatedly during a period of nine years before its removal. Copious diuresis followed each spontaneous reduction in the size of the tumour, which rapidly refilled. The patches of tawny or ochreous discolouration, above described, were scattered all over the main cyst wall. Mr. Meredith also describes the appearances which I have just noted; they were simply secondary cysts undergoing effacement; he wisely speaks of them as 'so-called "ulcerations."' In both cases—that is, whether an ochreous patch in the main wall, or a protruding secondary cyst breaks down—I have ever found that the changes in the torn tissue are not ulcerative, but atrophic, provided that the rupture be recent.

CHAPTER VIII.

TWISTING OF THE PEDICLE.

TWISTING of the pedicle of an ovarian tumour is a subject of great pathological and clinical interest. Many theories on the mechanism of this complication have been advanced, and its artificial imitation has even been advocated with a view to the induction of atrophy of a cyst, an ingenious idea which it is to be hoped will never again be brought into practice. Some of the latest views on axial rotation of ovarian tumours will be found in the last editions of the standard works of Sir Spencer Wells and Mr. Lawson Tait. In 1880 there was an interesting discussion on a paper read before the Obstetrical Society of London by the latter surgeon. Sir Spencer Wells observed that it was not difficult to understand how an ovarian tumour of moderate size could rotate and twist a pedicle of some length, and the mere alteration from the erect to the recumbent position was, in his opinion, enough to account for half a turn. If a tumour of moderate size be bulkier on one side, through the deposit of solid matter in a secondary cyst, or through other causes, it seems to me very easy to understand how it may roll over when the patient lies for some time on the opposite side. Mr. Tait, in his paper, advanced the theory that the passage of solid fæces along the rectum may act as a wedge, and thus gradually turn 'an ovarian tumour growing on the right side with a free pedicle, and resting with its axis inclined towards the top of the ninth or tenth rib on the left side.' At first sight this appears to be merely an ingenious theory, but at the time that the paper was read it struck me that Mr. Tait's opinion coincided with some of my own convictions grounded upon experiments that I had made when making necropsies on

cases of ovarian disease that had proved fatal before any operation could be performed. I had already observed that when a large tumour with an irregular posterior surface lay to the right of the rectum, an accumulation of fæces might press against the pelvic portion of the growth in such a manner as to push the whole tumour about a quarter of a turn round its vertical axis. Should the pedicle be very long, or very short yet inelastic, it would remain twisted after this pressure was removed, and might become still more twisted when the pressure was reapplied. In one body I found a large ovarian tumour pressed upon in this manner by the rectum, which was slightly distended owing to a cancerous stricture. A little artificial distension of the intestine caused it to press against the tumour so as to push its left side backwards, stretching and twisting the pedicle. In examining separately this same pedicle, which had not been twisted, except in the course of my experiment, I found that it was two and a half inches long, and an inch broad, and that some of its veins were completely plugged with old coagula. It may be observed that in many cases of considerable twisting of the pedicle the vessels are not so obstructed from within or without as might be expected.

I cannot see that the similar theories propounded by Mr. Tait and myself can be in any way unreasonable, based as they are on actual observations; still I believe that, as a rule, the twisting of a pedicle is to be explained by the simpler doctrine that the tumour, pressed upon by the viscera and even the costal cartilages above, and by the pelvic structures below, but comparatively free laterally and anteriorly, rotates on its own axis every time that the patient after walking or lying on her back turns round and rests on her side. Most healthy persons lie habitually on one particular side, and in cases of ovarian tumour, as in certain stages of inflammatory diseases of the lungs, such a choice may be due to tenderness in the opposite direction. Whatever theories may prove, the clinical results of twisting of the pedicle are very definite. This complication may cause rupture or sloughing of the tumour, arrest of growth of the tumour through obstruction to the vessels of the pedicle, absolute atrophy of the tumour,

and lastly, detachment of the tumour from the pedicle, and subsequent nourishment of its tissues through vascular adhesions.

So disastrous a catastrophe as gangrene has not failed to attract the attention of experienced operators, and Wells, Tait, Thornton, Wiltshire, and others have described cases of this complication where immediate operation, an imperative duty, has succeeded or failed in saving life. Sudden and violent pain in the abdomen, with vomiting, is a very suspicious symptom in a patient that bears a large tumour, presenting the characters of an ovarian cyst. For clinical reports of individual cases I must refer the reader to the special writings of the above-named surgeons. The principal features of this condition are too self-evident to need any discussion.

Rotation of an ovarian tumour and twisting of its pedicle is a frequent accident, yet consequent gangrene is rare. Arrest of growth is a far more common result. Dull, constant abdominal pains in a patient who keeps in good general health and bears a cystic tumour that increases but little or not at all in the course of many months or years is a suspicious symptom. When the abdominal incision is made, the surface of the cyst appears not white and glistening, but dark-brown and destitute of lustre. On plunging the trocar into the cyst, the contents are found to be very thick and dark, for the twisting of the pedicle causes rupture of innumerable small veins in the inner lining membranes of the cyst, and the colouring matter of the blood undergoes alteration in the ovarian fluid. Similar hæmorrhages, with consequent discolouration of the contents of the cyst, are very frequent in large, old, highly multilocular tumours where the lining membranes of the secondary cysts are thin, and the vessels provided with very weak walls. On the collapse of the cyst and its withdrawal through the abdominal wound, the twisting of the pedicle will be at once detected. A pedicle thus affected is very favourable for the application of the ligature, and when adhesions have not been numerous the prognosis in these cases is very good. I have seen tetanus follow and prove fatal in one case where the pedicle of a parovarian cyst was found to be twisted, and was very readily and safely secured by transfixion and ligature; but the

cause of the fatal complication appeared to be a draught. Of twenty-one cases of operation on ovarian tumours with twisted pedicles at which I have assisted, only two ended fatally, the case just mentioned and one case where very multiple adhesions existed.

The obstruction to the vascular supply of a tumour following twisting of its pedicle not only causes arrest of the growth of the tumour and hæmorrhages into its cavity, but these hæmorrhages may be sufficient to induce marked anæmia, as I once observed in a patient upon whom Mr. Thornton operated. Of necessity such hæmorrhages can only be serious when the twisting is slight enough not entirely to obstruct the vessels in the pedicle.

In examining a twisted pedicle from a cyst removed in 1882 by Mr. Meredith, I found that the hydatid of Morgagni had undergone a remarkable calcareous degeneration; the fimbriæ of the tube were atrophied.

The first case of ovariectomy in my own practice was an example of dermoid cystic disease of both ovaries, with atrophy of the tumour on the right side through twisting of the pedicle. A married woman, aged thirty-two, consulted me in March 1882 for relief from an abdominal swelling, which did not inconvenience her from its bulk, but caused constant abdominal pain, and a peculiar feeling of irritation referred to the iliac fossæ. In the summer of 1881 she noticed an oval lump in the left iliac fossa. She sought advice at a general hospital in London, but it was found that she was pregnant, and she was recommended to wait until she had been confined before submitting to operation. This decision was evidently justifiable, as the tumour could not have been large or dangerous at the time, and there was no necessity to put the patient to the risk of an abortion. On January 26, 1882, she was confined, at full term, of her fifth child, which only lived for three weeks. On March 26 the catamenia reappeared. The abdominal pain was particularly severe when the patient coughed.

On examination, I found a small tumour occupying the lower part of the abdomen, from the pubes to two inches above the umbilicus; it was not very tense, and fluctuated in all directions. The uterus was fairly movable and pushed to the left;

the cyst could not be felt in the pelvis, but to the right of the uterus there was some fulness.

At the operation I found that the tumour was a dermoid cyst of the left ovary, filled with seven and a half pints of a greasy chocolate-coloured fluid and masses of a half-liquid fat resembling pomatum; there was an epidermic lining on the walls of two secondary cysts, which contained spicules of bone. On searching behind the right broad ligament I drew up a heavy oval body, three inches in its long diameter, which took the place of the right ovary. The pedicle was twisted and atrophied to an extreme degree, resembling a large nerve stretched over the surface of the cyst and connecting it with the back of the uterus. I applied a ligature to the pedicle, as a safeguard, though I doubt whether it would have bled if it had been simply cut across, and its proximal end dropped back into the pelvis. The cyst was stuffed with a very dense mass of coarse, black hair, mixed with yellow fat; its walls were lined with epidermis. The patient made a very rapid recovery, and on the first day after operation observed that all the abdominal pain and the feeling of irritation in the iliac regions had entirely disappeared. These symptoms were, I believe, mostly due to the remarkable condition of the right ovary. The rapid and early growth of a dense mass of hair and fat in its interior, with little increase in bulk, had made it very heavy. It had hung down in the pelvis and rolled about, so as to become twisted round its own pedicle, a complication that had arrested its further growth. The tumour of the left ovary was neither large nor heavy, and less likely to have been the chief source of irritation than the small but heavy and particularly solid tumour that had been shaking about in the pelvis for months.

The twisting process may be continued to a degree yet further than in my case. In 1881 Mr. Thornton operated upon a woman aged 34, who for seven years had presented symptoms of an abdominal tumour. In the interval she had given birth to four children. As in the case just described, the pain was out of proportion to the size of the tumour. At the operation a spherical dermoid cyst the size of a cricket-ball was removed; it was entirely detached from its pedicle, and adhered to the omentum, which supplied it with blood (fig. 27). The right

ovary was then found to be cystic and was removed. The left Fallopian tube was obstructed and slightly dilated; close to it,

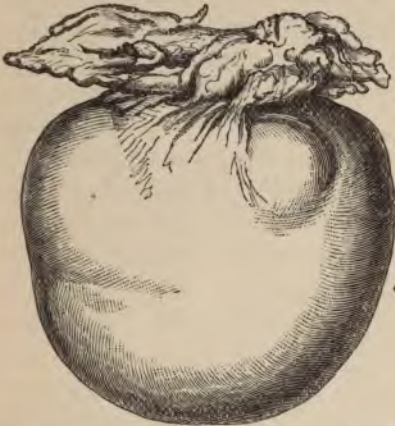


FIG. 27.—DERMOID CYST, TWISTED OFF ITS PEDICLE, and receiving its vascular supply from the adherent omentum. (Museum of Royal College of Surgeons, Pathological Series, No. 4549.)



FIG. 28.—STUMP OF PEDICLE OF TUMOUR represented in fig. 27.

in the site of the ovarian ligament, lay a short, firm tag of fatty and partly calcareous tissue (fig. 28). Dr. Heywood Smith has described a similar case.

It not unfrequently happens that the cyst becomes so intimately adherent to the omentum or parietal peritoneum that all its vascular supply is obtained in this manner, as Dr. Ritchie and others have already indicated. The irritation, set up by rotation of a cyst and the twisting of its pedicle, causes, in many cases, such adhesions, and then the pedicle tends to atrophy, and may break off as in Mr. Thornton's case. This sequence of changes accounts for the comparative rarity of gangrene after twisting of the pedicle. In a young girl upon whom I operated in 1883, I found a large, heavy dermoid cyst with a very narrow pedicle just beginning to be twisted from left to right. For some weeks before operation, the patient had suffered from symptoms of peritonitis, and, on placing my hand on the upper part of the tumour, I could for several days feel very marked crepitus. At the operation I could find no adhesions, but the parietal peritoneum and omentum were inflamed. All symptoms of inflammation

rapidly subsided after the removal of the tumour. Had the operation been delayed, the twisting would probably have continued, and the peritoneal inflammation increased till adhesions would have been established; on the other hand, rupture of the cyst, or gangrene of the tumour from occlusion of the vessels in the pedicle, and the failure of vascular supply through adhesions, might have occurred. In 1880 I assisted Dr. Bantock in an operation on a young woman, where a large ovarian cyst was found connected with the parietal peritoneum and the omentum by very abundant, and very vascular, shaggy adhesions (fig. 29). The pedicle was twisted and much



FIG. 29.—CYST TWISTED OFF ITS PEDICLE, receiving vascular supply through adhesions.
(Museum of Royal College of Surgeons, Pathological Series, No. 4551.)

atrophied; its veins were distended and blocked with solid friable clot. In the course of the same year, I assisted the same surgeon in a precisely similar case and operation; the tumour was twisted one whole turn on its pedicle, and the adhesions were very numerous, the vermiform appendix being closely connected to the cyst by a vascular band. A year later I saw Mr. Thornton operate on a case where the tumour was nourished by a very vascular and intimate omental adhesion; in this case the pedicle was but slightly twisted, but its veins were com-

pletely plugged. I have assisted at several other very tedious cases of the same kind; two, both under Mr. Thornton's care, being in pregnant women—these cases recovered. In another case where Dr. Bantock operated, the omental adhesions were very intimate and troublesome to secure, and the ileum adhered closely, but was readily separated with little subsequent hæmorrhage.

In the chapter on dermoid tumours of the ovary, I mentioned a case of a patient aged 35, in whom two ovarian tumours were found, the left being a simple multilocular cyst with a short pedicle, whilst the right was a spherical dermoid tumour with a twisted pedicle. The sketch (fig. 30) shows the condition of one of the veins in this pedicle. The vein was dilated at one point into a small, thin-walled spherical cyst, which, when the specimen was fresh, contained fluid blood, and was not impervious, as a small probe from a surgeon's pocket case could be passed into the vein from its cystic dilatation. The walls of the undilated part of the vein were thickened. This specimen is preserved in the Museum of the Royal College of Surgeons (No. 4552 in the New Pathological Catalogue).

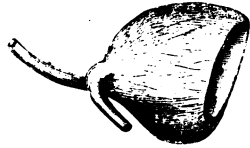


FIG. 30.—DILATED VEIN FROM
A TWISTED PEDICLE.

CHAPTER IX.

THE ABDOMINAL WOUND—NOTES ON ADHESIONS.

JUDGING from what I have witnessed, I cannot consider that the precise length of the abdominal wound is a matter of great importance. The removal of a large cyst through a small wound looks well, no doubt, but, although I have never seen sloughing, or even suppuration, of a wound caused by bruising in the course of the extraction of a large tumour, a cyst may be ruptured during the process, and the sponging out of the peritoneum will thereby be rendered more difficult under circumstances where it is particularly necessary. It is very frequently found in the middle of the operation that the uppermost part of the tumour adheres to the parietal peritoneum by very vascular bands of lymph; their separation causes much hæmorrhage, and, if the abdominal wound be not long enough, the operator will be obliged to prolong it considerably upwards in order to reach the bleeding points. This is to be avoided if possible, but, though the operator may dislike the necessity of compulsory enlargement of the wound, it is his duty to do so under the circumstances, and he may console himself by the reflection that the increased length of the abdominal incision entails in itself no increased risk whatever, as Sir Spencer Wells has shown, whilst a better view of the bleeding vessels on the parietal peritoneum will be of great advantage both to the patient and to the surgeon. To evert the edges of a long wound, and to secure the bleeding vessels, is an easy task; to have to direct an assistant to raise the upper angle of a short wound, and to 'make shots' with a pair of forceps at vessels bleeding, half in the dark, on the surface of the peritoneum above the level of the wound, is a troublesome proceeding, especially if the patient be not perfectly under the influence of

the anæsthetic, so that the recti take to violent and irregular contraction during the process.

In order to bring the knife as directly down on the linea alba as possible, it is best to follow closely the slightly pigmented line on the integuments, which runs from the umbilicus to the pubes, or to cut straight between those points when the line does not exist. This is highly important, as lateral deviations of the knife may entail abscess, especially if the linea alba be missed altogether, and the sheath and fibres of the recti be dissected up or lacerated. The patient must be kept well under the influence of whatever anæsthetic is employed when the linea alba is being divided, or else the parietal peritoneum will be forced against the knife, and fluid possibly ejected into the operator's face; the cyst wall and adherent intestine may also be put into jeopardy. The incision of the peritoneum, and its complete division to the extent of the rest of the wound, is an easy matter if done deliberately, though adhesions may complicate this stage of the operation.

I do not attach much importance to the material employed for suture; silk threads answer very well, and I can speak highly of the silkworm gut advocated by Dr. Bantock; in six of my own ovariectomies I have found it answer admirably. Care must be taken after gut sutures have been introduced that they are not jerked out of the assistant's hands whilst the operator is introducing or withdrawing the sponges employed for cleansing the peritoneum, an accident likely to happen, as they become slippery when wet. It is best during these manipulations that the ends of the threads should be collected on each side, and held together by compression forceps. As the cut ends of the gut after the wound has been closed are rather stiff, the operator must be careful that some of them do not turn directly upwards or downwards and sink into the wound. The withdrawal of silkworm-gut sutures is a matter of great facility; the point below the knot where the scissors should be applied can readily be reached by the extreme point of those instruments with the least possible amount of pressure on the integument, and, when cut, the gut slips out smoothly and painlessly on gentle traction with a pair of dressing forceps.

I have never seen a case of complete failure of union of the edges of the abdominal wound, although I have seen two abdominal sections where it burst open during vomiting, but neither were ovariectomies. Damage to subcutaneous fat or laceration of the fibres of the recti may cause abscess and greatly protract convalescence, but the skin and peritoneum unite with great rapidity, often in the worst cases that die two or three days after operation. This ready union of the wound is one of the great advantages which the advocates of complete intraperitoneal ligation of the pedicle can claim over the clamp method. Indeed, the chief danger in the former case is that the wound heals so rapidly that the patient may be tempted to walk about too soon; but this ambition must be checked by the surgeon or the nurse, else a hernial dilatation of the cicatrix may occur. This exceedingly troublesome complication is also caused by the operator failing to pass the threads through every layer of the structures on each side of the wound, excepting through the fibres of the recti, and by pulling the sutures too tight when the wound is closed—a common error with beginners which interferes with the process of cicatrization. Mr. Thornton, who has laid great stress on this point, operated in 1879 on a middle-aged patient, removing an ovarian cyst, ovariectomy having been performed by another surgeon fifteen years previously. There was no special difficulty about the second operation, but the integuments of the abdomen around the old cicatrix had become distended into a pouch by the gradual yielding of the cicatricial tissue, which was more marked in the peritoneal layer than in the integument. The affected integuments were therefore cut away, with great benefit to the patient, and I made a preparation of the parts removed, which is now preserved in the Museum of the Royal College of Surgeons (Pathological Series, No. 4562, New Catalogue). A patient with hernia of the cicatrix once informed this ovariectomist that the complication gave her more trouble and pain than had ever been produced by the tumour. A similar case occurred in the hospital practice of the same operator in 1880; the first ovariectomy had been performed ten months previously, and at the second, as a small hernial protrusion of the lower part of the old cicatrix existed, the entire line of scar was pared away. I have

seen a radical cure of an umbilical hernia attempted on this plan, in the course of an operation for the removal of a mixed sarcoma of the ovary, but the patient died of acute pelvic peritonitis. There is no particular risk in such a manœuvre as far as the abdominal wound is concerned, but the condition of the contents of the hernia may render interference serious.

Three preparations which I have made for the College of Surgeons Museum show that the abdominal wound unites well even in cases that die from the operation. One of these (4561, New Pathological Catalogue) shows the integuments around the abdominal wound from a middle-aged woman who died six days after the removal of an ovarian tumour. The edges of the wound are brought together by silkworm gut; at most points the apposed edges of integument are united; posteriorly the peritoneal surfaces appear everted, so as to lie against each other; this was, of course, effected by the usual method of application of the sutures; they were found to be adherent, in the deeper part of the wound, by recent lymph, easily broken down. It must be remembered when it is necessary to open an abdominal wound, through slipping of the pedicle and other catastrophes, within a few days after operation, that the union of the divided peritoneum, though produced rapidly, is for some time not very firm, and offers no obstacles to the operator. Another and similar preparation (No. 54, New Catalogue) is from a case of a girl where death occurred, from tetanus, eight days after ovariectomy. The contractions of the abdominal muscles had been very severe for thirty hours previous to death, as I can testify, having watched the case for a colleague. The wounded peritoneum had united very closely throughout; the integuments adhered uniformly, but slightly, and were readily parted by traction at the necropsy.

The last preparation (No. 55) is from a patient aged forty-nine, who died twenty days after ovariectomy. Twelve days after operation, facial erysipelas occurred, followed by ostitis and periostitis of the right side of the lower jaw, which was partially necrosed. Abscesses were found in the lungs and kidneys (this point is noticed in reference to the same case in another chapter), and there was pus in the pericardium. A full report of the case, by Dr. Bantock, will be found in the *Medical Times*

and Gazette, vol. ii. 1879. The patient was exceedingly corpulent, but in the preparation the union of the integument is very perfect, excepting at one point, where a drainage tube had been inserted. The peritoneal borders of the wound were so feebly united by lymph that they came apart on gentle traction at the necropsy. This case shows that the gravest complications have no marked effect on the wound; though the peritoneal union had softened, it had not broken down before death.

The value of compression forceps is well shown in the rapid healing of the abdominal wound after ovariectomy, as they avoid the necessity for at least four or five ligatures which would certainly interfere with union of the divided structures. I have never seen any bad result from the use of these forceps, but I have seen an abscess where a ligature had been applied.

In speaking of the abdominal wound, I must here refer to two remarkable cases, both in the hospital practice of Mr. Thornton, which illustrate the bad effects of incision and drainage, when undertaken as a substitute for ovariectomy. They form very instructive preparations in the Museum of the Royal College of Surgeons. The first was that of a woman aged thirty-five. A surgeon attempted radical cure of an ovarian tumour by making a deep incision into the cyst, which was allowed to discharge through the abdominal wound. For two years and a half, purulent fluid escaped through the wound, and produced hectic symptoms; the patient also suffered from secondary syphilis, and became much reduced in health. Mr. Thornton removed the remains of the cyst, with tissues around the fistulous track, through which the pus escaped. The specimen is here figured (fig. 31). It will be seen that the cyst has been reduced to a small cavity, which, in the specimen, measures hardly two inches in its longest diameter. This cavity, not laid open, is lined with a layer of exuberant granulations, and communicates with the surface of the abdomen by a fistulous track about an inch in length. In the sketch, the puckered integument around the external orifice of the track, cut away with the rest of the tumour at the operation, is represented, and at the opposite extremity of the preparation is a second cyst, spherical, and about half an inch in diameter. It was trans-

parent when fresh. Below the larger, and close to the smaller cyst, is the fimbriated extremity of the Fallopian tube, which

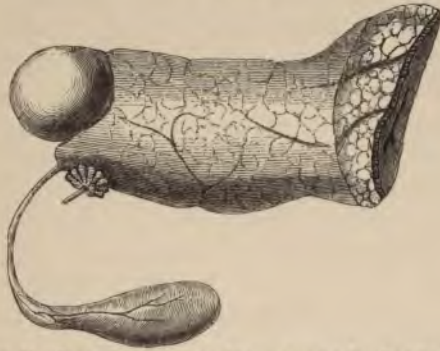


FIG. 31.—CYST AND ADJACENT PARTS AFTER LONG DRAINAGE.

has acquired a communication with the cavity of the larger cyst, which gives the observer the impression that a dilated tube might have been punctured; from the history, however, there appears to have been a large ovarian cyst at the time when incision was performed. A glass tube has been passed into the mouth of the tube, and close to the fimbriæ a long, thin-walled, pedunculated body is represented; this appears to have been a hypertrophied hydatid of Morgagni. I have referred to this peculiarity in Chapter III. Recovery in this case was complete, but protracted. The specimen is numbered 4553 in the New Pathological Catalogue of the College Museum.

A similar specimen is No. 4554 in the same series. The patient was also under the care of Mr. Thornton; she was forty-nine years of age, and a few years previously another surgeon had endeavoured to cure a cystic ovarian tumour by puncture of the cyst, and insertion of a drainage tube through the abdominal wound. Much clear fluid escaped for months, but no suppuration occurred; and when the tube was removed, the communication between the cyst and the surface of the body rapidly healed up, and the cyst refilled. It was, therefore, removed with the adherent portion of integument, and the patient recovered perfectly. The preparation consists of a multilocular ovarian tumour, one cyst greatly exceeding the others in size, measuring six inches in diameter. The entire tumour is adhe-

rent to a portion of the abdominal wall which was removed with it at the operation, and shows a puckered cicatrix which has deep connections with a band of tissue that runs to the cyst wall behind. There is no trace of any granulations on the inner lining of the large cyst which had been kept open.

These cases show that incision and drainage are bad substitutes for ovariectomy; they also demonstrate that an abdominal wound will bear a great deal of prolonged surgical interference. This is also shown in cases where the drainage tube has to be used after complete ovariectomy, and in the results of hysterectomy, when the uterine stump lies for weeks protruding from the lower angle of the wound. In fact, in itself the abdominal wound is a trifling part of the operation of ovariectomy, and the bad results following long incisions are due to the tumour or to other conditions which made a long wound necessary, and not to the wound itself.

Any work on ovarian tumours would be incomplete without some notice of the subject of adhesions. The presence of adhesions constitutes one of the most important complications which the operator has to encounter. Hence all the standard works on ovariectomy dwell on this subject at great length. I will confine my remarks chiefly to the question of diagnosis, and to cases where the vermiform appendix adheres to the tumour.

One of the chief difficulties in the diagnosis of adhesions is the uncertainty of the results of peritonitis, so that after severe and repeated attacks of that complication, disabling the patient for weeks at a time, no adhesions may form, whilst the most intimate connections between the cyst wall and the parietal and visceral layers of the peritoneum are sometimes found in cases where patients have suffered from very little pain, and have seldom been confined to their beds from the date of the first appearance of the tumour. Age, long-standing ill-health, and repeated tapping, do not by any means imply a greater probability of the existence of adhesions, but are, on the other hand, frequently associated with recurrent peritonitis, and no subsequent organisation of inflammatory effusions, excepting such changes as bring about a simple thickening of portions of the serous membrane. Some constitutional diseases actually tend to prevent the occurrence of adhesive peritonitis, so that

the patient is saved from one troublesome complication though exposed to greater risks of another kind. In another chapter I referred to two cases in my own practice where symptoms of peritonitis, checked by medical treatment, were very marked before operation, but no adhesions could be found when the tumour was removed. One of the patients was a woman aged forty-eight; she had been twice tapped, and three weeks before ovariectomy she had been seized with a rigor, and a rise of temperature to 101.4° , after a uterine sound had been introduced. Her general health had been bad for several years, and she had seldom passed one pint of urine in twenty-four hours for six months before operation. Three weeks later I assisted Dr. Bantock at an operation on a patient who was nearly twenty years older, but in very good health; the cyst had been tapped several times, but symptoms of peritonitis had not been marked. The cyst was found to be universally adherent to the parietal peritoneum, the lower part of the great omentum was intimately connected with the tumour, and the anterior surface of that serous fold adhered to the parietal peritoneum. The operation was very tedious, and drainage was found to be necessary. In June 1881 I assisted the same surgeon in an ovariectomy on a patient aged forty-five, who had enjoyed very good health for the two or three years since the discovery of the abdominal tumour. Occasionally she had felt pains in the hypogastrium, attributed to flatulence, but she had never been confined to her bed. At the operation the cyst wall was found to be perfectly free from parietal adhesions anteriorly, but laterally it was strongly adherent, and its separation was a matter of considerable difficulty.

It is not necessary for me to enter into further details on the subject; suffice it to say that I have noted over forty-five cases out of five hundred ovariectomies where multiple adhesions existed without any previous history of peritonitis or of other symptoms which would lead the surgeon to suspect their existence. On the other hand, I have found that cases where adhesions have been suspected, but have not been discovered at operation, are yet more frequent. I must once more refer to the crepitus detected on palpation when the omentum is inflamed, or when the inflamed parietal peritoneum rubs

against the cyst wall. This signifies that adhesions cannot exist over the area of crepitation, since 'so long as the friction can be felt or heard, movement must be free;' such are the words of Sir Spencer Wells, and they must ever be borne in mind.

In over six cases that I have seen, the vermiform appendix adhered to the cyst. This is a troublesome kind of adhesion. The branch of the ileo-colic division of the superior mesenteric artery that runs along the appendix bleeds very freely when divided, after retracting to a considerable extent, and if the appendix itself be cut it must be ligatured, but some mucous membrane will be left on the distal side, and very possibly, as the ligature is being tightened, a cylindrical cast of the appendix, composed of fæcal matter, will be squeezed out, and will drop into the peritoneal cavity if the operator and assistant be not careful. It is therefore advisable to wash the distal end thoroughly with tincture of iodine before returning it into the abdomen.

Adhesion of the vermiform appendix appears almost invariably associated with extensive adhesions between the tumour and other abdominal structures. In a patient aged forty-seven, upon whom Mr. Thornton operated in the spring of 1880, a large cyst of the left ovary was exposed when the abdominal incision was made, abundant parietal and visceral adhesions were found, and the right Fallopian tube and vermiform appendix adhered firmly to the cyst. About half an inch of the appendix was cut away. It may here be observed that it is not very easy to secure the artery separately, after tearing the adherent appendix away from the cyst wall, as is often attempted, with a view of leaving the appendix intact. In this case the separation of adhesions prolonged the operation, which lasted a hundred minutes; the patient recovered. A few days later a similar operation was performed on a woman aged thirty-five at the same hospital, and adhesions were so universal and the structures adjacent to the tumour were so altered by pathological changes that the true nature of the patient's disease could not be determined till after death, when I found at the necropsy that the tumour was a fused double ovarian cyst. I have mentioned this case in the chapter on multi-

locular cysts. At the operation the vermiform appendix was found to be stretched, and over six inches in length; three inches of that tube adhered strongly to the wall of the cyst, and some of the adherent portion was absolutely inseparable, so it was cut away, and the remainder of the appendix separated from the tumour and ligatured, when a plug of solid fæces, the calibre of a No. $\frac{1}{2}$ English catheter, was squeezed out.

Within a very few days of this operation Mr. Thornton removed a large cystic mixed sarcoma from a woman aged fifty-seven. The pedicle was broad, short, and apparently infiltrated with sarcomatous matter; it adhered by a band of tissue to the vermiform appendix. There were no other adhesions in this case, but the surfaces of the tumour and the intestines were covered with shreds of inflammatory lymph. The patient recovered from the operation. Thus three cases of adherent vermiform appendix occurred in the same hospital very close together, the first being on March 17, the last on March 24, 1880.

The next case occurred exactly eleven months later. The patient was a woman aged fifty-two. Dr. Bantock had removed the left ovary for cystic disease three years previously, and on this occasion the right ovary, which had also become cystic, was taken away. The great omentum adhered intimately to the cyst, and the vermiform appendix, very difficult to distinguish at first, had formed close connections with the tumour. It was torn off the cyst wall and replaced in the abdominal cavity. The patient made a good recovery.

In 1884, I saw three cases of adherent appendix, all within the month of March, and all in the wards of the Samaritan Hospital. One was a case of uterine myoma; the second was ovarian. The patient was a young woman with a small multilocular cyst, the pedicle of which was twisted and atrophied. There were abundant parietal adhesions, and the appendix was firmly bound down to the surface of the cyst. Eight days later, Mr. Thornton operated on a case of ovarian cystic tumour, where the adhesion to the appendix was strong and hard to separate.

I once found, when making a necropsy, a detached cyst

adherent to the vermiform appendix. A woman aged fifty-five had died in the hospital before any operation could be performed. On opening the abdominal cavity I found a large papillomatous cyst of the right ovary universally adherent to the abdominal walls in front. There was also a small multilocular cyst of the left ovary, with glandular intracystic contents and strong adhesions to the surrounding structures. A small cyst, four inches long and one and a half broad, lay in the right iliac fossa. It had no connection with the tumour of the right ovary, and adhered firmly to the vermiform appendix. It contained several cavities which held fluid that was clear, like that in the right ovarian cyst, and smelt distinctly fæcal, though I ascertained that no communication existed between it and the canal of the appendix. There could be no doubt that this cyst had sprung from the ovarian tumour on the right side and become detached; several other cysts with clear contents lay in the pelvis. In this same case I found a cyst with a cavity large enough to hold a filbert, in the substance of the left suprarenal body. It contained clear fluid, and is preserved in the Museum of the Royal College of Surgeons.

Visceral and parietal adhesions have long since been considered at great length by authorities in ovarian surgery. Of the use of adhesions in cases of twisted pedicle, as sources of vascular supply to the cyst, I have already spoken in a former chapter. The shock during and immediately after the separation of extensive adhesions is often very marked, especially if the patient be not thoroughly under the influence of the anæsthetic.

CHAPTER X.

*COMPLETE INTRA-PERITONEAL LIGATURE OF THE
PEDICLE.*

THERE can be no doubt that at the present day the most usual method of securing the pedicle of an ovarian tumour is by complete intra-peritoneal ligature. I originally introduced this expression as the title of an article on the subject, published in the 'St. Bartholomew's Hospital Reports' for 1877, to avoid the repetition of longer and clumsier modes of indicating the same idea, such as 'ligature of the pedicle followed by cutting the ends of the ligature short, and replacing the stump of the pedicle within the peritoneal cavity.' It must be remembered that the adjective 'complete' refers to the fact that at the completion of the process both the ligature and the stump of the pedicle are entirely within the abdomen. When the clamp is employed, the pedicle is kept out of the peritoneum; when the cautery is applied, it may be replaced within the cavity of that membrane. Formerly, when the ligature was applied to the pedicle, its extremities were uncut and left dependent from the external wound. Hence the expression, which I endeavoured to introduce in 1877, implied a method essentially different from those just enumerated. In these days, however, the ends of the ligature are always cut short, and the clamp is but seldom used; hence it is sufficient to speak of 'ligature' as implying complete intra-peritoneal ligature of the pedicle.

It is not at all remarkable that this method was looked upon with great distrust and disfavour, even by many specialists, until a few years since. Judging from pathological and clinical observation, the surgeon has never been off his guard against the mischief likely to arise from foreign bodies remaining in the tissues. From time immemorial he has avoided the

permanent introduction of such substances into the body, excepting for the distinct object of producing counter-irritation. When necessity has compelled him to pass threads or pins into the tissues for such purposes as the arrest of hæmorrhage, he has ever been eager to remove them at the earliest opportunity consistent with safety. The immunity from inflammation, observed when—through accident—certain foreign bodies remain long in the tissues, though an assured fact, rests nevertheless on the evidence of comparatively few cases. Hence the surgeon has been slow to trust to immunity from bad results after deliberately leaving foreign bodies within the human frame. It is remarkable that the deviation from precedent has at last been established, not for any minor operation, but for one so beset with dangers, that it is of the highest importance to consider how every individual element of risk may be neutralised or eliminated.

Avoiding the polemical aspects of this, as of every other question connected with ovariectomy, I likewise do not deem it necessary to dwell on the oft-told history of the introduction of complete intra-peritoneal ligature. Long details will be found in the standard works of Wells and Tait, and in my own contribution to the annual 'Reports' of St. Bartholomew's Hospital. The manner in which this method was gradually introduced, the supposed and real effects of ligature on the stump of the pedicle, and the true share it has borne in fatal results where it has been employed, are more instructive matters for consideration.

The introduction of complete intra-peritoneal ligature was not precisely empirical, but rather due to the fact that the surgeon probably considered that it entailed less risk than the practice of leaving the ends of the ligatures dependent from the abdominal wound. Dr. Nathan Smith, of Connecticut, was the second ovariectomist; the first to practise complete intra-peritoneal ligature. The immortal McDowell, of Kentucky, did not cut the ends of the ligature which he employed in the first ovariectomy. Dr. Nathan Smith in 1821 ligatured two arteries in the pedicle of an ovarian cyst, and secured two vessels in the omentum. The material for ligature was leather cut in strips from a kid-glove. The ends of all the ligatures

were cut short, and the external wound closed, the stump of the pedicle having been returned into the abdominal cavity. The patient recovered. The method was continued with varying success, and fluctuations in favour among specialists, till the successes of Sir Spencer Wells, who preferred the clamp, caused it to be discountenanced for many years. When that ovariotomist began his career as an operator, the clamp appeared to be the simplest and most trustworthy appliance for securing the pedicle; nor was complete intra-peritoneal ligature thoroughly understood. Subsequent experience has proved its true value, and it is now almost universally employed even by Sir Spencer Wells himself.

One great hindrance to its rapid introduction was a misapprehension of the nature of its effects on the stump of the pedicle. There was for long a fixed idea that the stump must slough, or would at the least be very prone to become gangrenous, and that the ligatures would become encapsuled, yet very liable to cause pelvic abscesses. Experience has shown that the stump does not slough, and that the ligatures do not as a rule cause abscesses; indeed, they actually become absorbed. When a finger is tightly constricted by a thin cord or stout piece of twine, the distal part is cut away from all its vascular supply, and lies literally out in the cold, far from the heat-producing organs of the body. The changes in the proximal part of the finger, caused by the constricting cord, are of no avail in saving the distal part; on the contrary, they aid in its amputation. Surgeons formerly overlooked the fact that the ligatured pedicle is in a different condition. Its need for vascular supply is small from the first moment that the tumour has been cut away. It is literally nursed by the warm peritoneum that surrounds it, and it lies in the human body, a marvellous heat-producing apparatus that keeps it in a regular temperature of about 100° Fahrenheit, which is more than any wool, poultice, or ingenious, but complicated, artificial instrument could do. True, when fever follows, the pedicle may be made hotter than may be good for it, but the bad effects of fever on a wound or injured part alone are slight. There is yet a more important factor in the agencies that save the pedicle. The bulging of the tissues over each side of the groove, formed by

the ligature, brings the strangulated portion of the stump at once into close contact with the unstrangulated proximal part. Through the slight irritation, produced at first by the pressure of the ligature, the proximal part throws out plastic lymph, which conveys nutritive plasma, and, ultimately, capillaries to the distal portion of the stump, which is thus saved from gangrene. The credit of the practical demonstration of this very important fact must be given to Dr. Bantock, who in 1872 exhibited at the Obstetrical Society of London the stump of an ovarian pedicle from a patient who had died of cancer a year after double ovariectomy had been performed upon her. In the Museum of the Royal College of Surgeons are a series of specimens, which I have prepared, where the condition of the ligatured pedicle from a few days to six months after operation is shown, and the conditions above described are plainly displayed. The bulging and approximation of the tissues of the pedicle on each side of the ligature are generally well marked, and the ligature itself is usually buried in lymph, which connects the distal and proximal parts of the pedicle.

One of these specimens is from a patient aged thirty-seven, who died in the Samaritan Hospital in 1877 from septicaemia on the sixth day after the removal of a large ovarian cyst. There was no evidence that death was in any way due to this method of treatment. At the present date, when sponging out of the peritoneum and drainage is carried out with far greater efficiency and boldness, owing to increased experience, than in 1877, such a case would, in all probability, recover. The stump of the pedicle, now preserved in the College Museum, is an inch broad, and its inner border is a quarter of an inch from the fundus of the uterus. When recent, I found that it was not in a sloughy condition, nor was it congested. It was separated from the uterine appendages by four silk ligatures, none of which had cut into the tissues, but all were covered with bands of lymph, bridging over the constriction which they had produced. The outer extremity of the distal side of the pedicle was already very firmly united to the broad ligament by well-organised lymph; it had touched the ligament and then acquired adhesions; this change, however, I have never found in any other specimen that I have examined. In a case that

died of tetanus on the eighth day, the adhesion of the bulging tissues over the pedicle was well marked (fig. 32). The



FIG. 32.—STUMP OF AN OVARIAN PEDICLE; death from tetanus on the eighth day after operation. The silk ligatures are completely concealed; a glass rod is passed between them and the bands of lymph passing from the proximal to the distal portion of the stump.

severest septic changes in the peritoneal cavity after the separation of multiple adhesions, or inflammation of a portion of sarcomatous tissue or cyst wall left behind, often fail to affect the changes which take place in the pedicle.

On April 5, 1876, Dr. Bantock removed a large multilocular tumour from the left ovary of a girl eighteen years of age. The patient made a good recovery; but in the following October the right ovary became the seat of a sarcoma. An exploratory operation was performed, and, on account of the character of the tumour, it was not deemed advisable to remove it. The patient died on November 3, 1876. The pedicle had shrunk to a small fleshy knob; its free upper edge had fallen over and curled inwards, forming an adhesion to its anterior surface. A vascular band ran externally from the atrophied pedicle to the broad ligament, and a still more important adhesion connected the pedicle with a portion of the omentum which had become adherent to the fundus of the uterus. These somewhat unusual adhesions had saved the pedicle from further atrophy. Since 1877 I have seen several such stumps of pedicles in the course of a second operation for the removal of a tumour in the opposite ovary. The stumps were as a rule hardly larger than a boiled pea, and entirely free from adhesions.

In the specimen just described and preserved in the College Museum, and figured in the paper already quoted, a deep

groove marked the position of the hempen ligature, not a trace of which remained. In other cases where silk had been employed, the ligature had also entirely disappeared; of course I am now referring to pedicles as they appear many months after ovariectomy. The fate of the ligature silk is an interesting question. A pedicle, immediately after ligature, is often a good stout bunch of tissue. The calibre of the loop of silk that encircles it must be considerable. Six months later, a groove round a little fleshy button is all that can be seen of the pedicle and the seat of ligature. It is clear that the silk cannot pull itself tighter, and it becomes buried in lymph so soon, in favourable cases, and that lymph organises into firm tissue so much more rapidly than the collateral process of shrinking in the distal part of the stump, that the silk can hardly slip off the pedicle, even if transfixion had not been practised at the operation. May it not work its way through the lymph and the atrophied stump, as in the case of a ligatured artery? I do not deny that this may sometimes occur; and to search the peritoneum for a small loop of silk, probably buried in organised lymph, would be no easy task. But cannot the silk be absorbed? Many that still doubt that this can occur, once asserted that a ligatured pedicle would be almost certain to slough. A distinguished London hospital surgeon once observed to me, referring to the advocates of the ligature, and to my own observations in the 'St. Bartholomew's Hospital Reports: 'I have no patience with people who say that silk ligatures can be absorbed by granulations.'

It would be interesting if some experiments were made on the chemical action of serum, pus, and other organic fluids upon silk fibre. Then it might be ascertained whether absolute solution of the fibre or simple disintegration by maceration takes place, or whether the fibre resists all destructive processes after prolonged exposure to the action of serum at a temperature of 100°. But the experiments of Spiegelberg and Waldeyer and Maslowsky, so often quoted by Sir Spencer Wells and other authorities, prove that after intra-peritoneal ligature of the stumps of excised portions of the horns of the uterus in bitches, a communication between the distal and proximal parts of the stump is established by inflammatory plastic effu-

sion, and the ligature is unravelled by granulation cells insinuating themselves between its fibres. There can be no doubt, in my opinion, about the unravelling, but I have never proved that the silk fibres are actually absorbed. Perhaps disintegration is more probably the cause of the disappearance of the ligature. In concluding this part of the argument, it may be remarked, as a brief summary of what has just been under consideration, that the ligatured pedicle does not slough, and that the ligature does not set up any prejudicial local mischief. The question of drawing the silk as tight as possible, and of the significance of the coagulum, which forms more or less on the free surface of the stump, will be considered farther on. I may here observe that carbolised catgut answers some of the purposes required for ligature of the pedicle, but it is hardly to be relied upon for wide, tough, thick, and short pedicles. I must, however, admit that I have had no experience of its use.

The most important question concerning complete intraperitoneal ligature is the share it has played in leading to fatal results. This subject I treated at length in a second communication to the 'St. Bartholomew's Hospital Reports,' 1878. The mortality is considerably less at the present date—1884—than it was six years ago. Before entering into any arguments or general details, I will enumerate the only cases where I found unfavourable changes in the ligatured pedicle itself after death.

CASES OF UNFAVOURABLE CHANGES IN THE LIGATURED PEDICLE.

1. A. F., 61.—Removal of the left ovary for cystic disease; death on the fourth day. Pedicle of the left ovary very tightly ligatured by transfixion; congested and sloughy in parts, but adherent to the broad ligament by recent lymph deposited along its outer and posterior border. Ulceration at several points from pressure of the ligature. An adhesion between the tumour and the sigmoid flexure had been separated during the operation; this adhesion was old and well-organised and left on the bowel a raw surface the size of a halfpenny, where the muscular coat was exposed. At this spot the calibre of the intestine was diminished to a diameter of under a quarter of an inch. The walls of the bowel at the seat of obstruction were inflamed and thickened. There was no other morbid appearance in the body.

2. Mrs. J., 41.—Large dermoid cyst of the left ovary. The pedicle was secured by complete intraperitoneal ligature, and its outer extremity was drawn up against the abdominal wall through transfixion by one of the threads of silkworm gut which closed the external wound; death on the fifth day. Pedicle secured by eight stout silk ligatures, inflammatory effusion thrown out between its anterior surface and the broad ligament. Free border not sloughy; a small friable clot adherent to it. One of the ligatures traversed an abscess cavity in the broad ligament, and a soft, dark red clot, commencing in the substance of the pedicle, extended into the abscess. The right Fallopian tube was dilated, and contained a drachm or more of foetid, reddish fluid. A coil of small intestine was adherent to the stump posteriorly. The abdominal cavity exhibited no traces of peritonitis. The kidneys were diseased; they are described in Chapter XI. No. 15.

3. J. F., 27.—Removal of both ovaries for cystic disease; numerous adhesions to abdominal wall, omentum, intestines, and uterus. Death on the sixth day after distinct pyæmic symptoms. There was universal peritonitis, consolidation of the base of the left lung, and disease of the right kidney, described in Chapter XI. No. 25. The pedicle of the right tumour, which alone had contracted adhesions to neighbouring parts, included a portion of the cyst wall, which was adherent to the back part of its own pedicle. This remnant of the cyst was partly sloughy and partly suppurating. The left pedicle was capped by dark, soft clot, but had contracted no adhesions, although lymph was thrown over the ligatures.

4. Mrs. S., 39.—Removal of a cystic tumour of the right ovary; internal hæmorrhage and death within twenty-four hours. The left Fallopian tube, which was dilated, had been opened and some of its vessels secured; there had been numerous parietal adhesions. The pelvis and lower part of the abdominal cavity were stuffed with about two pints of dark coagula, mostly issuing from the vessels of the left tube, but partly from vessels on the left side of the abdominal parietes. The pedicle on the distal side of the ligature was very small, its free edge being hardly half an inch wide; it was capped by a dark clot. A large varix, looking like a small sausage, lay over the right common iliac artery. It extended from the level of the lower end of the right kidney to the ligature that secured the pedicle. It was formed by dilatation of the right ovarian vein, and contained solid, dark clot.

5. Mrs. W., 49.—Removal of a cystic tumour of the right ovary. Pyæmic symptoms, and death twenty days after operation, from peri-

ostitis of the lower jaw. Pyæmic changes in several of the viscera. The left ovary, already slightly cystic, had suppurated. The stump of the pedicle of the right ovary was sloughy and covered with a brickdust-coloured exudation. It was firmly secured by ligature; the contiguous parts adhered over the threads by the medium of sticky lymph easily broken down.

6. S. A., 45.—Removal of a multilocular cystic tumour of the right ovary, containing papillomatous growths. Peritoneum infected with the papillomatous growths. Death on the fifth day. On the free surface of the pedicle was a mass of papilloma, breaking down and mixed with coagula. The ligatures were buried by the adhesion of the distal and proximal part of the pedicle, and the veins in the proximal portion were plugged, the broad ligament was infiltrated with sarcomatous deposit and adherent to the rectum, which was thereby partially obstructed. The right femoral and external iliac vein were completely plugged with clot partly decolourised.

7. A. M., 26.—Removal of sarcomatous left ovary. High temperature and cerebral symptoms, death on fourteenth day. Evidence of slight meningitis; peritoneum healthy except towards pelvic region. A loop of ileum adhered, by recent lymph, to the parietal peritoneum close to the left iliac fossa; the same loop adhered inferiorly to another coil. On raising the two loops, an ounce of thick creamy pus welled up. This fluid lay in a cavity formed above and anteriorly by the coils of ileum, posteriorly by the rectum, and below by the fundus of the uterus and the pedicle. All these structures were adherent continuously, and the cavity, tightly closed, was lined with a partly sloughy pyogenic membrane. The pedicle, which included the left angle of the fundus of the uterus, projected freely, from below, into the abscess cavity; it was partially secured by a single stout silk, which was rather loose, but there was no cap of coagulum, and this part seemed sloughy on the distal side. The outer part of the pedicle was secured by another silk ligature; between the ligatured parts, and internal to the inner and sloughy piece, the pedicle was free and open, no clot covered the two open surfaces, but on peeling off the pyogenic membrane which covered them, sarcomatous tissue was exposed. The tumour had been sessile, and had not been transfixed; the open surfaces had been caused by a yielding of the structures beneath, evidently some days after the operation, otherwise much hæmorrhage would have ensued.

8. Mrs. S., 40.—Removal of multilocular cystic tumours of both ovaries; death in fifty-seven hours. Purulent peritonitis, large

collections of pus between the liver and diaphragm, Douglas's pouch filled with purulent fluid. Pedicles of both ovaries well secured; puriform fluid oozed from the distal end of the left pedicle.

9. Miss D., 40.—Colloid disease of the ovary; death four days after operation. There was universal pelvic peritonitis, and the pelvic viscera were swimming in pus. The pedicle was infiltrated with colloid, its free border was suppurating but not sloughy.

In all the remaining necropsies that I have made on cases of death after ovariectomy and ligature of the pedicle, the appearances of the stump of the pedicle were the same as in the specimens which I have already described as representing the normal changes after ligature; and no pus, no sloughy tissue, nor any sign of hæmorrhage, beyond the amount necessary to form a cap to the free surface of the stump, could be found. An analysis of the nine cases where I discovered a clearly unfavourable condition of the pedicle may prove of some interest. I have described the appearances in full, and will now add my own interpretation of them.

In the first, sixth, seventh, and ninth cases, there is strong evidence that the changes in the pedicle represented the primary cause of death. This is very questionable with regard to the fifth, eighth, and especially the second. The third was a remarkable case, bearing rather on incomplete ovariectomy than on the treatment of the pedicle. In the fourth, death was due, on direct proof, to hæmorrhage; but the plugging of the ovarian vein was a remarkable and unfavourable change, partly involving the pedicle, and therefore necessary to record as an abnormal condition of that structure after ligature.

The sixth, seventh, and ninth are the most important, for they illustrate the great danger of leaving portions of new growth or colloid material behind in the stump. In the ninth, the evidence that the pedicle was the primary seat of mischief was strongest, and the advocates of the clamp might reasonably observe that it would have been better had the pedicle been secured outside the peritoneal cavity. This could not have been done in the seventh case, which was exceptional; the tumour was sessile, and the uterine tissue had been encroached upon; application of ligatures proved very difficult, and the

unfavourable changes were rather due to the impossibility of applying the ligature in the usual manner, than to any fault in that method in general. In the sixth case, the pedicle was in a highly unfavourable condition, but the state of the peritoneum must also be considered; nor is the cause of the plugging of the veins quite evident. It must here be observed that experience proves that the presence of colloid or sarcomatous material in the pedicle is by no means an indication of certain death, after removal of the tumour and complete intraperitoneal ligature. I have seen the best results in very bad cases.

In the first case probably both the changes in the pedicle and the intestinal lesion took a share in the fatal result. It is always possible that the operator may pull the ligature so tightly as to cause sloughing, before the salutary changes already described can save the stump of the pedicle. There was no covering of organised coagulum, so often observed on the cut surface of the stump. On the other hand, the pedicle, not cut so long as to be entirely free at its margin from vascular influence, had become adherent posteriorly to the broad ligament. This favourable pathological change suggests that the congestion and actual slough of parts of the stump had been secondary. Now the condition of the sigmoid flexure of the colon represented morbid influences quite sufficient to destroy a patient sixty-one years of age, and exhausted by suffering, followed by a severe operation. These influences possibly induced the sloughing of isolated spots on the pedicle after the establishment of the favourable adhesive changes.

The fifth was a remarkable and obscure case, the cause of the death of which gave rise to a controversy published in the *Medical Times and Gazette*, vol. ii. 1879, p. 607. The sloughing of the distal end of the stump of the pedicle was possibly secondary to the pyæmia, whatever may have been the cause of that deadly complication. In the eighth case, also, the suppuration of the pedicle was very probably secondary to the purulent peritonitis. The second demands much consideration. The thrombus, which was found extending for a considerable distance on both sides of the ligature, had become disorganised, and undergone suppurative changes. The pus might have

arisen from the sole disorganisation of the clot, excluded by the coats of its veins from the tissues around, or that fluid might have been produced externally, and entered the vein at the free border of the stump of the pedicle: the latter interpretation is more in accordance with modern ideas. The thrombus might have induced phlebitis and suppurative inflammation outside the vein, or the compression of the vein by inflamed or œdematous tissue around it may have caused thrombosis, after the manner so distinctly noted by Billroth. The coagulum itself, whether primary or secondary, was actually breaking up in the abscess cavity. The diseased state of the kidneys favoured retrograde changes in the thrombus. But putting aside the still unsettled questions respecting thrombosis and pus in veins, it must be remembered, when considering the abscess in this pedicle, that in the same case the right Fallopian tube was dilated, and contained a drachm or more of foetid reddish fluid; hence the state of the tube might have been the cause, and not the effect, of the other morbid changes. In ovariectomy, it is always dangerous to leave a dilated tube behind; the strong tendency to suppuration in an oviduct thus affected is significantly demonstrated by the surgical experiences of Mr. Lawson Tait.

The third case is complex; the pedicle of the left tumour was in a satisfactory condition; that of the right included a piece of the cyst wall that could not be removed; the fragment had suppurated, and partly sloughed. Hence this case shows the risk of leaving portions of cyst wall behind, rather than the dangers of ligature. When the tumour cannot be completely removed, the operator should aim at securing every bleeding point in the cut edge of the piece of cyst left behind. This is safer than putting all trust in tightly constricting ligatures applied to the broad ligament below the cyst. The vitality of a piece of tumour is less than that of the ordinary tissues of a normal pedicle.

The fourth case is a curiosity, as far as the present subject is concerned, but a few words must be said on the plugging and 'hæmatoceles' of the veins of the broad ligament. After the ligature is secured, the operator has to devote some time to the cleansing of the peritoneum; and when he has performed that

duty, he frequently finds, on taking a last look at the pedicle, that there is a large globular distension immediately below the ligature. The nature of this swelling is evident; it is a varix, often wrongly termed a hæmatocele, but its importance, judging from experience, is trifling. I must have observed it over a hundred times, but have never been able to trace bad results from this complication, and the plugging and obliteration of an entire ovarian vein can be of little import when a large tumour whence it received its blood has been cut away. In this case, the emptiness of all other veins in the patient's body made the condition of the ovarian vein all the more prominent.

Although I have not seen any bad results that could be directly referred to the varix, which sometimes forms immediately on the tightening of the ligature, a reference once more to the second case suggests a possible source of severe risk; and, without wandering into theories concerning phlebitis, the conditions which caused an abscess to form in the pedicle in this case would probably prove more rapidly fatal to life in instances where a varix exists. In this case, however, a vein in the pedicle had been wounded—in fact, the ligature crossed the abscess cavity—whilst a varix arises from the tight constriction, and not from the transfixion of large veins. When assisting Dr. Bantock in removing a large multilocular cyst of over twelve years' duration from a woman aged twenty-nine, I observed that the pedicle was very thick and broad, and its veins were extremely dilated. On applying and tightening the ligature, which transfixed the pedicle in the usual manner, a large varix formed. The operator, objecting to leave matters in this condition, secured the open mouths of the vessels on the cut surface of the pedicle, loosened the ligature, and turned out a mass of clot from the varix. The pedicle was then transfixed at two points below the level of the first ligature, and secured in that manner by a chain of three ligatures. The case did very well, and more than a year later I observed a similar condition of things, when assisting the same surgeon, in a case where amenorrhœa, changes in the nipples, and discolouration of the vulva, with the presence of a soft globular mass in the hypogastrium in front of the fluctuating cyst, raised a natural suspicion of pregnancy. This mass proved, at the operation, to be simply an

outgrowth from the main cyst. The pedicle was broad and short, and the ovarian vein much dilated. They were both secured, the vein being tied separately. A very large varix quickly formed. Dr. Bantock on this occasion did not loosen the ligature that transfixed the pedicle, but simply cut that which had secured the vein. A great mass of coagulum was then turned out of the vein, which was tied once more. The patient recovered. Hence, if the operator dread the idea of leaving a varix behind, there is no difficulty in calmly and deliberately emptying its contents. Such a course is especially advisable when it is evident that a vein has been transfixed in the application of the ligature.

In the great majority of cases the transfixed and ligatured pedicle undergoes the favourable changes described at the commencement of this chapter; and, as it is so rare to find unfavourable conditions of that structure after death, matters are still more satisfactory, as regards the pedicle alone, when the patient recovers, and there are none of the disadvantages attendant on the separation of the distal end of the stump when the clamp is employed. Much has been written about the cap of clot which covers the raw surface of the pedicle in most cases, but I cannot see any reason to attach much importance to it. As might be expected, I have generally found a soft dark coagulum on the raw surface of the pedicle in cases where the patient has died within twenty-four hours of operation, from causes with which the pedicle has had nothing to do, and in similar instances where the patient has not succumbed till long after ovariectomy I have found a clot undergoing organisation. On the other hand, on examining the body of a woman aged fifty, who was very weak, and died of acute bronchitis seven days after ovariectomy, much prolonged by the presence of numerous adhesions which had to be separated, I found that the free border of the stump of the pedicle was not capped with any clot, but its edges had united through inflammatory changes on the raw surface between them. Much lymph covered the ligatures, so as to establish a communication between the distal and proximal part of the pedicle, in the manner already noted. The absence of a clot is, however, rare.

The significance of the clot on the pedicle has been the

subject of some of the numerous disputes between operators that have been so conspicuous in recent medical literature. A very large proportion of patients recover perfectly after ligature of the pedicle, and it is reasonable to suppose that in them, as in the fatal cases, that structure may sometimes be capped with a large clot, sometimes with a small clot, and, in rarer instances, with none at all. It is only in the second of the series described above that there was any suspicion of primary decomposition of the clot, though, should septic changes arise elsewhere within the peritoneal cavity, the clot may readily become infected. Mr. Thornton is a strong advocate of the practice of a moderate and not extreme tightening of the ligature. In his experience, the stump, when tied too tightly, frequently becomes painful a few months after operation. He considers that the presence of a cap of clot is a good sign, as it proves that the ligature has been drawn tightly enough to prevent serious hæmorrhage, yet not so tightly as to cut off all supply from the distal portion of the stump. I have expressed precisely the same opinion elsewhere, and in Hegar's practice a tightly ligatured false pedicle of a sessile cyst actually sloughed, and was discharged from the rectum, the patient recovering. In the last edition of Sir Spencer Wells's work, I find the following passage: 'I differ entirely both from Mr. Doran and Mr. Thornton, and, fearing that a loose ligature will become looser as the included tissue shrinks, that bleeding would be probable, and that unless a ligature sinks deeply into, or forms a deep groove in the pedicle, the surfaces of peritoneum on either side of it are less likely to unite, cover up the silk, and maintain the vitality of the stump, I always tie the ligatures as tightly as I can.' The practice of securing the vessels in the outer border of the pedicle separately—a practice attended by the very best results—obviates the necessity of drawing the ligatures of the pedicle to an extreme degree of tightness, and thereby lessens the risk of sloughing. A very slight degree of tenseness is sufficient to cause the tissues to bulge over the groove formed by the ligature, and thus to insure salutary changes already described.

CHAPTER XI.

*MORBID CONDITIONS OF THE KIDNEY ASSOCIATED WITH
OVARIAN TUMOURS.*

IN speaking of the treatment of a patient before ovariectomy is performed, Sir Spencer Wells observes, in his standard work: 'One condition which certainly requires correction before the operation is undertaken is that common one where only a small quantity of highly concentrated urine, depositing mixed urates in abundance, is passed. If ovariectomy be performed on a patient in this condition, a serious amount of kidney congestion, with symptoms almost amounting to uræmic fever, is almost certain to follow the operation. Before undertaking it, therefore, it may be necessary to gain time by tapping.' The author then recommends that the patient should take alkaline carbonates largely diluted, especially lithia water or other preparations of the salts of lithium.

The excretion of small quantities of urine loaded with pink urates is very frequent; it tends, if unchecked, to set up slight cystitis, and renders the bladder very sensitive to the catheter after operation.¹ It appears, upon clinical evidence, to be due entirely to the pressure of the tumour, and if that growth be tapped, the urine is at once secreted in greater quantities, less charged with solid constituents. After operation, when no bad results follow, this scanty concentrated urine gives way, precisely as after tapping, to a more copious renal secretion. A far more dangerous symptom is the excretion within twenty-four hours of about a pint to a pint and a half of pale urine of

¹ The slight, or sometimes severe, cystitis *after* operation is too often due to carelessness on the part of the nurse, who may introduce the catheter with perfect skill and with sufficient frequency, yet neglect to clean it thoroughly after use.

a low specific gravity, not necessarily containing a single cast, nor yet a trace of albumen. I have observed several such cases in Dr. Bantock's wards, and after operation high temperature, falling with a rise in the excretion of urine, was the rule. Copious secretion of urine of a very low specific gravity is common in young hysterical patients, but is of no importance as regards operations and prognosis; it is certainly no indication for tapping. Lastly, the presence of a trifling amount of albumen, even up to one-twelfth, is not very serious if about fifty ounces of urine or more are passed in twenty-four hours, and if the characteristic symptoms of primary renal disease be absent. In long-standing cases of glandular tumours, almost solid, or in sarcoma of the ovary, scanty concentrated urine and œdema of the lower extremities and abdominal integuments are very often met with, and after successful operations they disappear and leave no trace of any suspicion of the existence of visceral disease.

I will pass over cases where evidence of primary renal disease was very strong, nor will I dwell on instances of absence of sulphates in the urine, or changes in that fluid attributed to carbolic acid poisoning. I wish to record the fact that in thirty-two out of over forty necropsies that I have made on the bodies of patients who have died, either after ovariectomy, or with large ovarian tumours in the abdomen, I found that the kidneys presented very distinct morbid appearances. The clinical evidence is strong that in the majority of these cases the disease was due to the presence of a tumour; the dilatation of the ureters immediately above the brim of the pelvis, where the pressure would be most direct, was probably more frequent than what I have represented it to be, as in some cases I may possibly have overlooked a slight degree of dilatation.

The appearances of the kidneys I now give at length, having rejected all details that might be fallacious, through being recorded by one who has not had very extensive opportunities for the special study of renal disease. I have already subjected the list to the scrutiny of my friend and former colleague, Dr. Goodhart, assistant physician to Guy's Hospital, whose opinion as that of a pathologist of wide experience in the post-mortem room of a great school of medicine, and in the

Museum of the Royal College of Surgeons, is of the highest value. After perusing my notes he wrote in reply, 'I have gone through your notes carefully and with pleasure, for disease due to pressure has always interested me. I have been in the habit of teaching the students in the post-mortem room that obstruction to the outflow of urine leads to (1) simple atrophy; (2) granular kidney, and (3) scarring of the kidney. I am also very interested to see the large number of cases in which you have found adhesion of the capsule. My impression is, and your facts bear it out, that adhesion of the capsule is one of the earliest and commonest features of backward pressure and of interstitial inflammation. It has always seemed to me that, though pressure is liable to produce granular or contracted kidneys, they are usually, when from this source, of a peculiar pattern, so that, from the look of the organs, you might have a suspicion of their cause; and one of these peculiarities is considerable irregularity of size, one kidney being much larger than the other; another is the association of deep puckerings, or scars which indicate bygone inflammation or sometimes superficial abscess; and altogether, the granulation of the surface of each kidney is very irregular and diffused. Now, all these points are, I find, illustrated by your notes. Of congestion, pallor, softness, toughness, and similar appearances, the original observer can alone gauge the significance. They often mean only the mode of death, rather than any distinct renal disease; but, of course, in association with any other disease they may mean a good deal.' As for the congestion, I believe that in the cases here recorded it was often due to septic changes.

In Dr. Russell Reynolds's 'System of Medicine' will be found a valuable contribution by Mr. Marcus Beck on nephritis and pyelitis consecutive to affections of the lower urinary tract. I had not turned my attention to Mr. Beck's researches until quite recently, when the importance of the signification of the marked prevalence of morbid changes in the kidney in ovarian disease became evident as I looked through the records of my own necropsies. I repeat, what I have observed before, that I have never had the opportunity of studying renal disease, excepting, I may add, in 1871, when I held the appointment of

house physician to Dr. Southey at St. Bartholomew's Hospital, and then, strangely enough, in relation to later experience, I had under my care an unusually large number of cases of chronic interstitial nephritis, and attended several necropsies on the patients of others, who had died of that disease. Between 1877 and 1882, I made a large number of necropsies on patients dying from ovarian and uterine tumours or after ovariectomy, outside as well as within the walls of the Samaritan Hospital. The frequency of changes in the kidneys, resembling those seen in interstitial nephritis, struck me very forcibly; unfortunately, lack of time prevented me from making any microscopical preparations of the kidneys which I examined. In searching through the literature of the subject, Mr. Beck's paper particularly struck me. It refers directly, as its title implies, to the results of vesical, prostatic, and urethral pressure; still, much of its contents bears indirectly upon the kind of pressure which may be produced by tumours. I will first recapitulate my own cases, and then compare my notes with the observations to be found in Mr. Beck's paper, employing the classification adopted by that surgeon.

CASES OF DISEASED KIDNEYS FOUND ON POST-MORTEM EXAMINATION AFTER DEATH FROM OVARIAN TUMOUR, OVARIO-TOMY, OR HYSTERECTOMY.

Death after removal of a multilocular ovarian cyst occurred in all cases where no other cause is specified.

SERIES I.—*Direct Effects of Pressure Evident.*

1. J. S., 26.—Death from acute inflammation of a large multilocular tumour of the right ovary; peritonitis and pleurisy; papilloma of the left ovary, which had become fused to the right, and infiltration of the broad ligament. Right kidney $4\frac{1}{2}$ oz., pelvis much dilated at the expense of the cortical portion, which was mottled, but mostly pale; the capsule was not adherent. Left kidney $5\frac{1}{2}$ oz., much enlarged, surface on section mottled, chiefly pale; pelvis not dilated.

2. A. H., about 35.—Death ten minutes after the removal of a very large fibroid tumour of the uterus. Right kidney with several puckered depressions on its surface, capsule not adherent. Substance mottled; cortical portion not narrower than normal. Left kidney

with pelvis dilated to the size of a walnut, surface of glandular portion very irregular under the capsule, which was not adherent; cortex very narrow, not tough.

3. S. G., 43.—Death on fifth day; purulent peritonitis, old adherent pericardium. Right kidney $4\frac{1}{2}$ oz., capsule not adherent, firm, very pale, mottled, stellate veins on surface strongly marked. Left kidney $2\frac{1}{2}$ oz.; pelvis much dilated at the expense of the glandular substance; capsule strongly adherent, cortex mottled, contained one cyst $\frac{1}{8}$ inch in diameter.

4. Mrs. H., 26.—Death in fourteen hours, much emphysema. Right kidney $5\frac{1}{2}$ oz., capsule slightly adherent, substance congested. Left kidney contracted, capsule adherent, pelvis dilated, cortical portion granular with several cysts. Left ureter much dilated in its middle third.

5. Mrs. S., 39.—Death in three hours, other viscera healthy. Kidneys each $5\frac{1}{2}$ oz., pale, rather tough, capsules perfectly free. Right ureter dilated to calibre of nearly half an inch in diameter above the brim of the pelvis, but not dilated below that point.

6. Mrs. J., 35.—Death on fifth day; acute peritonitis, liver very large and pale. Right kidney 4 oz., much congested, capsule slightly adherent, tissue healthy, slight dilatation of ureter above the brim of the pelvis. Left kidney 4 oz., congested, capsule free, tissue healthy, ureter not dilated.

SERIES II.—*Diffuse Interstitial Nephritis*.¹

7. Mrs. A., 35.—Removal of a large sarcomatous ovary; pregnancy. Death in two days; aortic incompetency. Right kidney 4 oz., flabby, pale, contracting, capsule adherent. Left kidney 3 oz., less flabby, but pale and contracting, capsule considerably adherent, and surface puckered. Both kidneys smelt offensively urinous.

8. K. C., 37.—Death on tenth day; purulent peritonitis; other viscera normal. Right kidney 3 oz., contracted capsule intimately adherent, cortical portion very narrow, substance tough. Vessels between bases of pyramids visibly engorged. Left kidney $5\frac{1}{2}$ oz., capsule strongly adherent, glandular portion as on right side. In this case both ovaries were cystic and pressure must have been very great.

9. A. M. T., 39.—Death on fifth day; hæmorrhage from laceration of broad ligament, right pleura universally adherent, slight dila-

¹ The cases are here arranged, as far as was found practicable, in the order of their severity, the least diseased being placed last.

tation of right ventricle. Right kidney $4\frac{1}{2}$ oz., capsule entirely adherent, substance pale and tough, no infarcts. Left kidneys 5 oz., capsule entirely and strongly adherent, substance pale, much softer than in right kidney. A cystic dilatation $\frac{1}{8}$ inch in diameter lay in the base of one pyramid, filled with clear fluid. In another pyramid, near the base, was a white mass the size of a millet seed and soft on section.

10. Mrs. B., 63.—Death on fifth day; emphysema and dilated right ventricle. Right kidney 5 oz., deeply congested, capsule universally adherent, substance tough, several small thin-walled cysts under capsules filled with slightly turbid fluid. Left kidney $4\frac{1}{2}$ oz., a cyst one quarter of an inch in diameter under the capsule, otherwise appearances as on right side. Strong urinous odour from both kidneys.

11. Mrs. B., 41.—Death on third day. Slight emphysema, coronary arteries calcified, no valvular disease. Right kidney 5 oz., very soft, recently congested, capsules strongly adherent, stellate veins engorged, cortical portion very narrow. Left kidney $4\frac{1}{2}$ oz., less congested, capsule only partially adherent.

12. M. C., 58.—Death on third day; mitral constriction, no marked cardiac symptoms before death. Right kidney $4\frac{1}{2}$ oz., left 4 oz., both pale, capsules adherent, cortex much diminished in breadth, tissue very tough, most probably true chronic atrophy of granular kidneys.

13. Mrs. K., 26.—Case of twisted and completely obstructed pedicle; cyst very large, multilocular and entirely nourished by multiple adhesions. (See Chapter VIII.) There was severe shock following the separation of the adhesions, and the patient sank on the third day. The other viscera were healthy. Right kidney 4 oz., pale, stellate veins on surface marked, capsule slightly adherent, substance tough, pyramids congested. Left kidney $3\frac{1}{2}$ oz., pale, much contracted, capsule strongly adherent, substance tough, cortical portion very narrow, pyramids deeply congested.

14. Mrs. S., 48.—Death on seventh day; chronic emphysema. Right kidney 4 oz., left $4\frac{1}{2}$ oz., both much congested, capsules largely adherent, superficial stellate veins deeply injected. Cortex not narrowed, bases of pyramids much frayed out.

15. Mrs. J., 41.—Death on fifth day; abscess in pedicle. Right kidney $5\frac{1}{2}$ oz., capsule adherent, cortex pale and diminished in area. Left kidney $5\frac{1}{2}$ oz., capsule not adherent, other appearances as on right side. The ovarian cyst was large, but the renal disease was only incipient.

16. Miss D., 40.—Death on third day; suppuration of pedicle, which was infiltrated with colloid material. Other viscera healthy. Both kidneys pale, capsules adherent, cortex much diminished in breadth. The tumour was a multilocular cyst containing colloid material and very large. The patient was much emaciated.

17. Mrs. A., 42.—Death on fifteenth day; pharyngeal abscess, old pleural adhesions on right side. Right kidney 5 oz., left $4\frac{1}{2}$ oz., capsules of both adherent, cortex rather narrow.

18. Mrs. F., 35.—Death a few minutes after operation. Right kidney 4 oz., left 5 oz., both exceedingly pale, capsules slightly adherent, substance not abnormally tough nor soft, cortex narrow. The other viscera were healthy, except that the left pleura was almost universally adherent.

19. S. A., 45.—Ovariectomy, malignant infection of peritoneum, acute peritonitis; death on fifth day. Right kidney $3\frac{1}{2}$ oz., very tough, capsule adherent, cortical portion very narrow. Left 4 oz., similar morbid appearances.

20. Mr. B.—Death on fifth day; purulent peritonitis. Right kidney $6\frac{1}{2}$ oz., left 5 oz. Capsules adherent, cortex tough, deeply congested.

21. A. B., 54.—Death on second day; purulent peritonitis. Right kidney 5 oz., capsule slightly but universally adherent, substance tough, pale, cortex narrow. Left kidney 4 oz., similar appearances.

22. Mrs. O., 32.—Death on eleventh day; pyæmia, no disease of other viscera. Right kidney 5 oz., left $4\frac{1}{2}$ oz., capsules not adherent, substance rather pale, stellate veins much dilated at certain points, cortex very narrow.

23. Mrs. G., 49.—Death on fifth day; acute peritonitis, obstruction of ileum. Right kidney 4 oz., left 3 oz., capsules slightly adherent, glandular substance deeply congested. The other viscera were healthy.

24. F. H., 33.—Death in twenty-eight hours, acute congestion and œdema of lung. Right kidney $5\frac{1}{2}$ oz., left $4\frac{1}{2}$ oz., capsules not adherent, glandular substance very pale, slight mottling of outer surface under capsule.

25. Mrs. B., 42.—Dermoid cyst of both ovaries, cancer of the rectum, no operation. Right kidney 4 oz., left kidney 5 oz., both much mottled, capsules not adherent, stellate veins on surface much distended.

SERIES III.—*Acute Interstitial Nephritis.*

26. J. F., 27.—Removal of two large ovarian cysts, purulent peritonitis; death on sixth day. Right kidney much enlarged, capsule not adherent, numerous small abscesses on surface of gland and a few in its substance, also several puckered cicatrices. Pelvis and ureter dilated.

27. Mrs. W., 49.—Death three weeks after operation; periosteal abscess in left angle of lower jaw-bone; pyæmic changes in lungs. Right kidney $10\frac{1}{2}$ oz., left 8 oz., both deeply congested, capsules slightly adherent, numerous metastatic abscesses on the surface, and several, nearly a line in diameter, in the cortex.

SERIES IV.—*Cicatricial Kidney.*

28. Mrs. H., 42.—Death on twelfth day. Right kidney $4\frac{1}{2}$ oz., contracted, very tough, capsule closely adherent, large white cicatrices on surface, with extensive embolic infarcts. Section pale, slightly granular, pyramids normal. Left kidney 4 oz., much contracted, very tough, capsules adherent, no cicatrices nor infarcts, but surface highly granular on section; cortex narrow, pyramids engorged. Strong urinous odour from both kidneys.

29. Mrs. S., 34.—Removal of a very large multilocular cyst; death three minutes after the operation. Other viscera healthy. Right kidney $3\frac{1}{2}$ oz., very pale, capsule not adherent, surface much puckered, cortex very narrow. Left kidney $6\frac{1}{2}$ oz., deeply congested, appearances otherwise normal. It had evidently undergone compensatory hypertrophy.

SERIES V.—*Recent Congestion.*

30. E. B., 54.—Removal of a very large multilocular cyst after its rupture; acute peritonitis existed; death in twenty-four hours. Right kidney 5 oz., left 5 oz.; both highly congested, capsules quite free; Malpighian bodies markedly prominent.

SERIES VI.—*Renal Disease probably Primary.*

31. Mrs. S., about 40.—Removal of right ovary and pedunculated fibroid tumour of uterus, sloughing of pedicle of fibroid; death on fourth day. Other viscera normal. Right kidney 3 oz., left $3\frac{1}{2}$ oz., both congested, capsules slightly adherent, tissue soft. The small size of the kidneys suggested atrophy from long-standing disease.

32. E. H., 54.—Removal of a large multilocular ovarian cyst; much ascites; death on third day. Large fatty heart and nutmeg liver. Right kidney 7 oz., much congested, capsule quite free, substance very flabby. Left kidney $5\frac{1}{2}$ oz., congested, capsule quite free; substance firmer than on right side, minute cysts all over the cortex.

33. E. S., 56.—Death on fourth day; mitral and aortic incompetence. Right kidney $3\frac{1}{2}$ oz., capsule adherent, surface much puckered. Cortex very narrow, of tough consistence, and full of small cysts. Left kidney $7\frac{1}{2}$ oz.; capsule strongly adherent, surface less puckered than on right side; cortex not very narrow, but full of cysts. There must have been old disease of uncertain origin to explain the condition of the right kidney, and the apparent compensatory hypertrophy of the left.

As already stated, these appearances accord with what has been observed by Dr. Goodhart in cases of death from large abdominal tumours of every variety. I will now compare my notes with the remarks of Mr. Marcus Beck in the monograph already quoted, which must be generally familiar to the medical public, and refers to one cause of pressure not quite identical with that which existed in my own cases. The differences and points of resemblance in cause and effects may here advantageously be studied.

Mr. Beck first considers the effects of pressure on the kidney in the course of vesical and urethral disease. He rejects the old doctrine that in chronic stricture and calculus the valvular vesical orifice of the ureter becomes deranged, so as to allow urine to be forced back up that duct during attempts at micturition, and in that manner to distend its walls. The real cause of obstruction is stricture of the orifice of the ureter by the thick bundles of muscular tissue in the walls of the hypertrophied bladder, and by the thickening and induration of its mucous membrane. Hence, so far, obstruction from vesical changes and obstruction from pressure of a tumour on the ureter are very similar. In both cases, as far as the kidney is concerned, the mischief arises from obstruction of the ureter. In the case, however, of a tumour, there can be no question of the extension of decomposition of the urine from the bladder to the pelvis of the kidney, which Mr. Beck believes may occur in chronic vesical affections, though he denies the regurgitation

theory as a cause of dilatation of the ureter. The effects on the kidney which that surgeon has observed in cases of pressure on the ureter from without are very similar to those which I have described. It must be borne in mind, however, that in Mr. Beck's cases the obstruction appears to have been always more or less acute. In my own, the pressure was seldom very severe, and must always have varied in severity according to the patient's position. I have seen the ureter adherent to the back of a large ovarian tumour, yet not much dilated nor obstructed. Hence dilatation of the pelvis is often trifling or imperceptible in ovarian cases, and hence Series I. contains but few cases. In Case 2, where a very large fibroid uterine tumour was removed, the dilatation was most marked, and here pressure was particularly evident. In most of the cases, however, there was practically no dilatation at all. The ureters were constantly pressed upon by large tumours, and hence arose a constant, gentle, yet prejudicial pressure on the glandular substance of the kidney, as shown in Series II.

In these cases, as the secretion of urine is to a great extent dependent upon the difference between the pressure of blood in the Malpighian tufts and that of the urine in the tubules, it would be, as Mr. Beck observes, diminished to a dangerous degree, were not the pressure in the Malpighian tufts somewhat increased by the slight obstruction to the venous circulation caused by the great overgrowth of the inter-tubular connective tissue. Hence, in such cases the secretion of urine is increased, but its specific gravity is lowered; acute congestion may, however, choke the renal vessels, and cause complete cessation of the secretion of urine. In cases of ovarian tumour the suppression is rarely complete, but the abundant excretion of urine of low density is replaced for a time by a very scanty secretion of urine of a high specific gravity. This is the condition which Sir Spencer Wells has found so mischievous. I believe, however, that it does not represent acute congestion of healthy kidneys, but rather congestion of kidneys damaged by pressure. For, when a sickly middle-aged subject of ovarian disease passes scanty concentrated urine before operation, I have often noticed that, within a day or two after, that secretion becomes copious, and of a low specific gravity. During convalescence, the

density increases. But when an ovarian tumour is removed before it has attained large proportions, from a healthy young woman passing urine of the normal density, and without any deposit, the urine usually deposits urates very freely for two or three days, and then returns at once to the normal standard. The elimination of tissue waste should be rapid after a severe operation, but this cannot be effectively carried out when the kidney is damaged by pressure, but after the congestion ceases its more chronic morbid condition becomes displayed. The healthy kidney, on the other hand, eliminates effete products with great rapidity ; hence the abundance of urates.

As to the cicatricial processes, they may bear some relation to tapping, as they are said to bear to regular catheterism. But I cannot bring forward sufficient evidence to support this statement.

It must be remembered that the diseased kidneys which I have described here at length are, of necessity, from fatal cases, and I strongly believe, as I have asserted already in the course of discussions at societies on ovariectomy mortality, that their diseased condition was the chief cause of death. This consideration especially applies to the form of renal disease observed where pressure exists, but less evidently as a direct result of pressure. This form of secondary renal inflammation, termed by Mr. Beck and others diffuse interstitial nephritis, is very frequent in conjunction with ovarian disease ; and, on reference to Series II. in my list, it will be seen that a large proportion present all the characteristics ascribed to that disease. The adherent capsule, prominence of the stellate veins, frequent mottling of the glandular substance, and occasional presence of putrid urine, giving a strong odour to the gland, are all frequent characters of the kidneys which I examined. I cannot say that it is always easy to decide upon the exact nature of the pressure. From the position of the kidney it is well sheltered from any tumour that might press on its pelvis, at least from any ovarian or uterine tumour. As for congestion from altered blood pressure, or from causes similar to those that produce certain forms of nephritis in pregnancy, those are questions which I do not feel competent to decide. I believe that this diffuse interstitial nephritis is a result of a more prolonged,

but less extreme degree of pressure of the tumour on the ureter as it crosses the brim of the pelvis, than that which causes the more direct effects of pressure on the glandular structure of the kidney. I have already noted the case of true dilatation of the pelvis from pressure on the ureter by a heavy uterine growth. In an average, but chronic case of multilocular ovarian cyst, the pressure on the ureters is slight, but constant, and in such a case is diffuse interstitial nephritis most frequently found after death. This affection is far more symmetrical than the more mechanical type, and its symptoms more obscure; hence the surgeon may find before operation that the patient's urine is 'normal.' The temporary presence of urates may cause the secretion to be of the 'normal' specific gravity. The operation is performed; it may be perfectly simple, but too often death follows within three or four days, to the dismay of the surgeon, who then considers his case to be 'most extraordinary, as there were no symptoms of peritonitis, and everything went well, but I could not get the kidneys to act.' Then when the necropsy is made, the kidneys appear as in Case 7. I must here observe that a disaster of this kind is quite understood by my own colleagues, but many general surgeons appear still to expect that nothing can destroy life after ovariectomy but septicæmia or peritonitis.

The more acute form of interstitial nephritis, 'with scattered points of suppuration,' as described by Mr. Beck, and illustrated by Series III., is not frequent after ovariectomy. In Case 27, there were numerous abscesses, but it was an instance of very characteristic pyæmia, with metastatic abscesses in the lungs, and under the periosteum of the lower jaw. Hence the precise pathological nature of the renal abscesses must remain obscure. It is very possible, however, that chronic nephritis already existed; acute changes followed operation, and the kidneys became a focus of pyæmic infection. The great weight of the right kidney indicated old-standing disease.

Lastly, in some cases out of my series, the kidneys were merely acutely congested from other complications, and presented no chronic changes. Before dismissing these pathological questions, I must add that it is just possible that chronic nephritis independent of ovarian disease existed in some of

these cases. Several of the patients were of intemperate habits, or subjected to constant exposure to cold and wet ; in Series VI. I have reason to believe that this was especially the case.

Considering the brilliant statistics of certain specialists, and the frequency of renal disease in cases of ovarian tumour, it appears reasonable to suppose that removal of the tumour is frequently followed by complete recovery from the complication. There is a great difference between a subject that has recovered from ovariectomy, and has no constitutional tendency to chronic nephritis, and a gouty or cachectic individual who has granular kidneys, and, at the same time, cannot or will not refrain from diet and from habits that aggravate his disease and cause it to be so intractable.

CHAPTER XII.

TUMOURS OF THE FALLOPIAN TUBE.

IN works on anatomy, it has long been the custom to display the Fallopian tube as though it ran directly outwards from the uterus, with its fimbriæ floating freely apart from each other, as though they naturally floated in some fluid, the ovarian fimbria running directly downwards to the outer border of the ovary. This method of depicting the tube is well adapted for the simultaneous display of the other uterine appendages; and in this work I have been forced to represent them displayed in that manner, for otherwise it would be impossible to show the parovarium and the broad ligament cysts which are not par-ovarian. It must, however, be borne in mind that the Fallopian tube never lies in the position above described, in the living subject. Were that the case, then, before the ovum could enter the tube, it must either be ejected by the ovary into the ostium of the tube above it, which is a theory nobody would care to advance, or else the fimbriæ, under the influence of menstrual or sexual excitement, must descend and grasp the ovary, so that, as the ripe Graafian follicle ruptures, the ovum may fall into the tangles of the tubal fimbriæ. This is the *morsus diaboli* theory. The term just employed has been a fertile source of physiological error, just as the conventional manner of depicting the tube has led to anatomical misunderstanding. Professor Hyrtl has shown, in his *Onomatologia Anatomica*, that the term *morsus diaboli* was given to the fimbriæ of the tube, by anatomical teachers of a past age, on account of their resemblance to the root of the Devil's-bit scabious (*Scabiosa succisa*, Linn.), so called because there was once a widespread belief amongst the peasantry of Europe that the root of that plant appeared to be nibbled off—'præmorse,' as the botanists would

say—because the arch-fiend was in the habit of biting at it from below, in parts of the earth so saintly in those days that he had no more congenial employment.

In an edition of 'Gerarde's Herbal,' in my own library, dated 1598, I find the following observation on the name of this plant: 'It is commonly called *Morsus Diaboli*, or Divels (*sic*) bit, of the root (as it seemeth) that is bitten off. For the superstitious people hold opinion, that the divell (*sic*) for the envie that he beareth to mankind bit it off, bicause it woulde be otherwise good for many uses: it is called of *Fuchsius*, *Succisa*: in high Dutch (that is, German) *Teuffels Abbisz*; in lowe Dutch, *Duyvelles beet*; in French, *Mors du Diable*; in English, Divels bit, and Fore bit.' The truncated root axis and the radiating fibrils bear a resemblance, as near as are most other anatomical resemblances, to the expanded fimbriæ of the tube. To my own eyes, the flower of a Devil's-bit scabious, though it is purple and not red, looks far more like the fimbriæ as seen when expanded in water, and I cannot help thinking that the term *morsus diaboli* was first based on the latter simile. In any case, it was never originally intended to imply that the fimbriæ could grip the ovary under the influence of sexual orgasm.

It is singular that a botanical simile, connected, on the one hand, with a mediæval superstition, and, on the other, with the fact that many anatomical teachers, from the dawn of modern history until a very recent date, were also lecturers on botany, should tend to keep up a gross physiological error. Professor His demonstrated in 1881, in the *Archiv für Anatomie und Physiologie*, the true position of the uterine appendages, through a series of observations made on the pelvic organs of healthy young women killed by accident or suicide. The uterus was never found to lie symmetrically in the middle of the pelvic cavity; it inclined to the right in two cases, to the left in three. In subjects where the uterus inclined to the right, the right ovary lay with its long axis completely vertical, and with one side closely applied to the bony wall of the pelvis; but the left ovary, being dragged upon by the uterus, lay obliquely in the pelvis, traction being effected by the ovarian ligament, which pulled the anterior part of the ovary away from the wall of the

pelvis, the posterior extremity being still held against the brim of the pelvis by the fold of peritoneum which invests the ovarian vessels—the infundibulo-pelvic ligament of certain anatomists. When the uterus inclined to the left, the relative positions of the ovaries, as just described, were reversed. Each Fallopian tube forms a loop around its ovary, the anterior half of the loop ascending sharply over the ovary, the posterior loop, which includes the dilated part of the tube close to the fimbriæ, descending and bulging freely behind the ovary. Both sides of the loop cover a great part of the ovary like a curtain. The ovarian fimbria runs backwards and upwards on to the ovary, that organ being, as the above description shows, closely embraced by the free end of the tube.

I have repeatedly verified this discovery made by Professor His, finding that the healthy ovary hangs from its ovarian ligament obliquely downwards, embraced above by the tube, the fimbriæ of which lie on its surface externally, and, to a certain extent, inferiorly. The appearance of the ovarian fimbria running upwards on the ovary is very characteristic. To verify this description of the relations of the ovary to the tube, the intestines must be raised very gently, lest the uterine appendages be displaced. It is evident that the ripe ova can, by this arrangement, drop into the tube, and may fall at once among spermatozoa.

When a slight attack of pelvic peritonitis causes the fimbriæ to adhere to the ovary, the obstructed tube becomes dilated, and, instead of rising high above the ovary, as would be the case were the conventional ideas concerning the relative position of these structures true, half the dilated tube coils round the outer side and lower part of the ovary. For the same reason tubo-ovarian cysts lie outside or below the ovary, and never above it; and, in cases of foetation within the outer third of the tube, the ovary lies above the foetal sac, between it and the inner third of the tube. This morbid condition is frequently taken for ovarian foetation, simply because the foetus lies below the ovary, which would seem, to those who had not accurately studied the question, to be far out of the range of the Fallopian tube.

The relations of the Fallopian tube to ovarian and broad

ligament cysts have been already described in previous chapters. In large simple broad ligament cysts the tube becomes extremely stretched, as do the fimbriæ; in multilocular ovarian cysts the stretching is less marked, as the tumour does not press directly on the tube. I have seen true hypertrophy of the tube, however, in more than one case of this kind, and one specimen I have prepared and mounted in the Museum of the Royal College of Surgeons (Pathological Series, No. 4563, New Catalogue). The patient was a single woman, aged thirty-five. She suffered much from a large multilocular ovarian cyst, which had twice become inflamed, delaying operation. When the cyst was removed by Dr. Bantock, it was found to be universally adherent to the intestines and abdominal wall; but the tube hung free from its surface, measuring six inches in length, and with walls not only stretched, but also much hypertrophied. The tube was unobstructed, and the fimbriæ shared in the process of hypertrophy; shreds of lymph hung from some of them.

I have never been present at an operation where a tubo-ovarian cyst was discovered. A preparation in the College of Surgeons Museum (No. 4574, New Catalogue) shows this condition very plainly; it was taken in 1876 by Dr. Goodhart from the body of an intemperate woman, aged thirty-eight, who died from gangrene of one leg after a fall. Both Fallopian tubes are much dilated, especially the right, which has formed a communication with the corresponding ovary, that organ being dilated into a cyst over two inches in diameter. The ovarian ligament can be traced on to the surface of the cyst. There are numerous adhesions on the surface of the uterus, the result of chronic perimetritis. I have repeatedly examined this specimen, and have clearly traced the communication between the cavity of the dilated tube and the cavity of the ovarian cyst.

True tumours of the Fallopian tube are not common. The small thin-walled cysts that often stud its surface are really developed in the cellular tissue under the portion of the broad ligament that is reflected over the tube, as I have already demonstrated in another chapter. Tubal gestation is beyond the scope of this work. I may here remark, however, that I once saw a patient who was supposed, by several surgeons, to

he suffering from a large ovarian tumour, a 'thin-walled secondary cyst' projecting into Douglas's pouch. Menstruation had been absent for over a year. A long and tedious railway journey, with subsequent examination by several medical attendants, brought on very severe abdominal pains, rapidly followed by collapse and death. I performed the necropsy, and found that the 'cyst' was an eight months' fœtus, evidently developed in a dilated right Fallopian tube, the 'thin-walled secondary cyst' in Douglas's pouch being its head. The dilated tube had ruptured, and the consequent hæmorrhage had proved fatal.

It is not my intention to speak at length of dilatation of the Fallopian tube from simple obstruction—the condition known as hydrosalpinx when the fluid contents of the tube are clear, and pyosalpinx when they are purulent. Certain operative measures, practised and advocated by Mr. Lawson Tait and others, have thrown great light on these pathological conditions. In 1877, I prepared for the College of Surgeons Museum (No. 4571, New Catalogue) a remarkable specimen presented by Sir Spencer Wells. It consisted of two Fallopian tubes dilated to such an extent as to constitute cystic tumours of considerable magnitude. The right weighed, on removal, 4 lbs. 11 oz.; the left, 1 lb. 6 oz. Both contained a fluid like thin mucus. The left tube was removed with a portion of the ovary; several pedunculated cysts sprang from the broad ligament. Some of the cysts contained vegetations similar, microscopically, to the papillomatous growth from the interior of the Fallopian tube, which will shortly be described. The patient was a single woman, aged twenty-three. Nine months before operation she noticed a lump in her left iliac fossa; this enlarged and filled the lower part of the abdomen. The patient married nine months after the tubes were removed, and menstruation continued with perfect regularity for two years and a half, when she last wrote to the operator.

In over six cases of multilocular ovarian tumour I have seen dilatation of the Fallopian tube from obstruction; inflammation of the peritoneum or the cyst wall extending to the fimbriæ, which become matted together, so that the ostium is soon completely blocked. In these cases the fimbriæ, soldered together laterally, often share in the dilatation, and give a singular

appearance to the end of the tube, resembling a cluster of buds, or forming a kind of Maltese cross. When the ostium is blocked higher up, the fimbriæ, of necessity, cannot be involved in the dilatation; this is also the case when the obstruction is caused by pressure of bands of adhesion on the tube, or through kinking at any point internal to the attachment of the fimbriæ. In any case, when the dilatation has increased to a marked extent, the fimbriæ are generally obliterated altogether. A series of examples of hydro- and pyosalpinx, discovered in the post-mortem theatre of the Middlesex Hospital, formed the subject of an interesting communication recently read by Dr. J. Kingston Fowler before the Medical Society. There can now be no doubt that some of the more intractable cases of constant pain in the pelvic and iliac regions, often attributed to other causes, are really due to disease of the tube.

I have had the opportunity of examining one remarkable specimen of a true morbid growth affecting the Fallopian tube. The clinical history presents several features of considerable interest.

In October 1877, a maiden lady, aged fifty, thin and emaciated, came under the care of Mr. Bickersteth, of Liverpool. Four weeks previously she had experienced a severe attack of menorrhagia following amenorrhœa, which had lasted several months. There were now symptoms attributed to inflammation of the right ovary and surrounding cellular tissue. The local pain was severe, and there was vomiting, constipation, difficulty in micturition, general tumefaction of the abdomen, and high fever. She recovered perfectly after remaining in bed for six weeks. But in March 1878, she had an attack of pleural effusion on the right side. One hundred and twenty ounces of clear fluid were removed by tapping; then the abdomen began to swell, and on July 30 paracentesis was performed, and nine pints of fluid were drawn off; thirteen pints more had to be removed in September. In October, the right pleura again required tapping, by which means one hundred ounces of fluid were removed. In January 1879, the abdomen having again become swollen, sixteen pints were drawn off by the trocar and cannula. Ever since the subsidence of the symptoms of pelvic inflammation, throughout the period of recurrent pleural and

peritoneal effusion, there had been neither acute disturbance of the system, nor even so little as the solitary objective symptom of rise of temperature, and after each tapping recovery appeared to be for a time complete; nor was there any evidence of cardiac or hepatic disease.

In March 1879, two months after the third tapping of the abdomen, the patient was referred to Sir Spencer Wells for consultation, as the nature of the abdominal lesion remained very uncertain. During the first enlargement of the abdomen, Mr. Bickersteth detected a clear percussion note persistently in front of the abdomen, and a dull note in both flanks, most marked on the right side, slowly and slightly altered by change of position. Sir Spencer Wells recommended an exploratory incision, to which the patient at first objected; so the abdomen was simply tapped. Dr. Caton examined the fluid, which amounted to twenty-two pints. Its specific gravity was 1022, and it coagulated almost entirely under the action of heat and nitric acid. Its scanty flocculent deposit was found to consist of large cells, mostly grouped in clusters, and apparently proliferating; many were distinctly vacuolated, being of the kind described by Foulis and Thornton; indeed, the latter surgeon examined some of the fluid removed from this same case during the subsequent operation, and observed the same vacuolated, proliferating cells, which he kindly pointed out to me under the microscope.

Sir Spencer Wells, on examining the patient shortly after the final tapping, detected a hard, nodular mass behind the uterus, which organ was freely movable, and so low in the pelvis that the cervix lay close to the vulva. Dr. W. H. Day, at the same time, examined the thorax, and found evidence of the presence of a small quantity of fluid in the right pleural cavity, without any sign of disease of the lungs themselves. On account of the tendency to pleural effusion, he considered an operation imperative. Clusters of proliferating cells had been found in the pleural as well as in the peritoneal fluid.

On April 28, 1879, Sir Spencer Wells operated on the patient, employing strict antiseptic precautions. When the peritoneal cavity was laid open by the usual incision through the linea alba, seventeen pints of amber-coloured, opalescent

fluid escaped. The left ovary was normal; to the right of the uterus, which was of the usual dimensions, a tumour was found the size of a large orange, and consisting of the greater part of the right Fallopian tube; the ovary could be distinctly felt behind it. The tube and ovarian ligament behind the growth were secured by silk ligatures, and the tumour, and the ovary, which could not be separated from it, were cut away. The peritoneum was carefully examined for secondary deposits, but none could be found. The patient made a very rapid recovery.

On laying the tumour open, it was found to be filled with cauliflower excrescences, covered with a mucoid secretion, which issued from the open fimbriated extremity. About an inch of the innermost portion of the tube remained undilated and quite pervious. The remainder formed an elongated oval tumour three and a half inches long. Its upper, anterior, and posterior surfaces were uniformly smooth and white. On the inferior aspect, the abdominal orifice was plainly visible; it readily admitted a stout bristle, which entered directly into the cavity of the tube. The fimbriæ, although thickened and shortened, remained quite distinct. The ovary was an inch and a half long, and somewhat flattened. Its outer portion adhered to the tube, and contained three menstrual corpora lutea, one apparently quite recent. No cystic nor papillary bodies could be found within the ovary, but a small, transparent, thin-walled cyst projected from its surface. The broad ligament between the ovary and the undilated portion of the tube was much thickened, but contained no new growths.

The cauliflower excrescences grew from all parts of the mucous membrane of the dilated portion of the tube. Several cysts, with smooth exteriors and thin walls, rose by narrow pedicles from amidst the excrescences, and contained papillary outgrowths; other cysts had their walls roughened externally by similar new formations, also springing from their interiors. On microscopical examination, the cauliflower growths were found to be covered with countless secondary offshoots. The free surfaces of the growths were invested throughout with a single layer of columnar epithelium; some, but only few, of the cells in this layer were ciliated. The stroma was almost universally made up of small fusiform connective-tissue cells,

and was but poorly supplied with blood-vessels. I found that, at some points, chondrification had taken place. An engraving of the tube, with drawings of the microscopical appearances of sections of the cauliflower growths, will be found in the *Transactions of the Pathological Society*, vol. xxxi. 1880.

In August 1879, the patient had an attack of pleurisy; in September, Mr. Bickersteth reported 'dulness and deficient respiration, with feeble sounds over the right side of the chest, indicating thickening of the pleura from recent inflammation.' A few weeks previously Dr. Cameron had detected friction sounds over the same side. During her illness, the patient menstruated four times, at irregular intervals. The last period was about six or eight weeks before operation; the catamenia have never reappeared since the tumour was removed.

The absolute limitation of the epithelium to free surfaces in this specimen was sufficient to show that the growth was not cancerous; moreover, the patient, operated upon in 1879, was quite well in the spring of 1884. That the cells found free in the fluid were derived from the epithelium, there can be little doubt; that these free bodies might infect the peritoneum is also highly probable, but Sir Spencer Wells failed to find any secondary growths on the contents of the abdominal cavity which came within his reach during the operation. This is neither the first nor the last case where fluid with cells of this kind has failed to cause secondary malignant deposits, or even to indicate the presence of malignant disease; and, according to experienced operators, secondary deposits from ovarian cysts are by no means constantly malignant, as after histories have proved.

The excrescences of which this tumour was made up resembled a broad ligament papilloma, rather than a glandular ovarian growth; but, though the epithelial lining was partly ciliated, and the stroma relatively scanty, there was a distinct, thick, mucoid secretion, and the chondrification in the stroma resembled what is seen in intracystic adenoid growths. As far as development is concerned, tube, ovary, and parovarium are very distinct structures, and that there should be differences in the morbid growths that attack each of them is quite in accordance with the general laws of pathology.

Rokitansky states that new growths developed from minute papillæ, seen on the mucous membranes of diseased Fallopian tubes, are rare, and seldom exceed the size of a pea or a bean. Hennig has found that hyperplasia of the tubal mucous membrane passes into polypoid growth through the successive stages of warty and papillary tumours, these transitional forms being often found side by side in dropsical tubes. In a case of stricture of the tube by a band of lymph, this author found a warty outgrowth one centimètre broad, close to the seat of constriction, which growth he considered to be the result of chronic catarrh. The specimen now under consideration was evidently an unusually large example of the outgrowth recognised by Rokitansky and Hennig. The excrescences were, perhaps, not so much tumours as hyperplasiæ produced by chronic inflammation. They closely resembled the condylomata around the labia in venereal patients, especially frequent in cases where the external parts are irritated by copious and chronic discharges, or by want of cleanliness. Dropsy of the Fallopian tubes is nearly always preceded by catarrh of the mucous membrane. This case of papilloma of the tube began by symptoms attributed to inflammation of the right ovary, that is to say, the tube in reality was inflamed. The discharge of secretion through the abdominal aperture irritated the peritoneum, and produced ascites, for the abundance of the fluid, removed by tapping, shows that the peritoneal cavity was filled chiefly by its own secretion, and not by that thrown off from the growths in the tube.

The open condition of the fimbriated extremity of the Fallopian tube was a very unusual feature; indeed, Cruveilhier states that in dropsical distension, obliteration of that extremity is constant. The continuous flow of free mucous discharge from the earliest stage of disease probably accounts for the patency of the abdominal aperture in this case. Had the discharge been scantier and intermittent, the fimbriæ might have adhered to each other, and sealed up the tube; then the tumour would have attained a great size, but ascites would less probably have supervened, since no discharge could escape into the peritoneum so as to irritate that serous membrane, and spread a morbid influence as far as to the right pleura.

In February 1882, I assisted Mr. Thornton in an operation for the removal of a large broad ligament cyst, over which the Fallopian tube was stretched. The opposite tube was dilated, and bound down to its ovary by adhesions. On its upper surface was a thin-walled broad ligament cyst nearly an inch in diameter. The mucous membrane of the tube was studded with papillomatous outgrowths.

In conclusion, I must observe that it is possible that some of the papillomatous masses that infest the surface of the ovary and broad ligament may originate from the Fallopian tube, especially in those cases where no cysts can be found. The ovarian fimbria of the tube runs, it must be remembered, on to the surface of the ovary. In another chapter, I described a case of papillomatous cysts found in a fœtal ovary. In one of the sections, a mass of vegetations sprouted, without any capsule, from the outer end of the ovary. The epithelial lining was far more regular than in the intra-cystic growths, and, on examining a section of the fimbriated extremity of the Fallopian tube connected with this ovary, the identity of its epithelium and subepithelial stroma with the epithelium and stroma in the free vegetations outside the ovary became self-evident. In fact, these free growths very probably developed from the ovarian fimbria of the tube. The same morbid influence that set up papillomatous disease in the Wolffian tubes produced the same pathological condition in the adjacent fimbriæ.

In several cases of ovarian cysts I have seen a firm adhesion of the tube on the affected side to the opposite tube; the latter may also adhere to that part of the wall of the cyst that projects in its direction. These cases may greatly puzzle the operator; and when the patient recovers from the operation, it is difficult to feel sure what was the true meaning of the unusual position of the tubes. When, however, both tubes lie on the surface of a large cystic tumour, each with a distinct 'mesosalpinx' containing the parovarium—the tumour having a pedicle on both sides of the uterus—the surgeon may feel sure that he has to deal with a fused double ovarian cyst, a subject which I have already discussed at some length.

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[An excellent series of monographs on an important subject in relation to ovarian pathology, especially as regards the origin of papillomata.

I have made an abstract, in English, of Dr. Coblenz's works, which will be found in the *London Medical Record*, vol. x., p. 81. The monograph which stands first in the above list is particularly worthy of the attention of surgeons as well as pathologists. Agreeing almost entirely with Dr. Coblenz on the nature of papillomata of the ovary and broad ligament, I attach more importance to the entirely non-parovarian origin of the many thin-walled broad-ligament cysts.]

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INDEX.

ABD

- A**BDOMINAL wound, abscess in, causes of, 127, 128; danger of dissecting up tissues whilst making, 127; hernia of cicatrix of, 128; keeping of, open for drainage of cysts, 130; length of, not a matter of great importance, 126, 132; prolonging of, during operation often necessary and not difficult or dangerous, 126; suture of, materials for, 127; union of, often perfect in fatal cases, 129
- Abscess, in abdominal wound, 127, 128, 130; in pedicle, from ligature, 147
- Adenoma, adeno-sarcoma of ovary, 34; suspected case, of unusual character, 102. (See *Glandular growths in ovarian cysts*)
- Adhesions, 37, 38, 132; in cases of exogenous cysts, often very troublesome, 17; prevention of, by medical treatment, 37; in cases of twisted pedicle, carrying on the functions of the pedicle, 123; of sigmoid flexure to cyst, 19; of vermiform appendix, 19, 124, 132
- Alveolar sarcoma of ovary, 100
- Ascites, in cases of solid ovarian tumours, 93
- Axial rotation. (See *Twisting of pedicle*)

BRO

- B**ALFOUR, Professor, on 'Pflüger's tubes,' 2
- Bantock (Dr. G. Granville), on parovarian cysts, 54; on changes in pedicle after ligature, 140. (See also clinical reports *passim*)
- Beck (Mr. Marcus), on nephritis and pyelitis, 154, 160
- Beigel (Dr. H.), on atrophy of Graafian follicles, 6
- Bickersteth (Mr.), case of papilloma of Fallopian tube, 170
- Bilateral ovarian disease. (See *Double ovarian cysts* and *Fused double ovarian cysts*)
- Bladder, discharge of contents of cyst into, 86, 113
- Broad ligament, multilocular cyst invading layers of, 68, 73; ditto, with glandular contents invading layers of, 68, 75; cystoid degeneration of, 48
- Broad ligament cyst, simple, 49, 53; often considered to be parovarian, 48; reasons why this theory must be modified, 49; often distinct from the first, from the Fallopian tube and broad ligament, 47; relation to broad ligament, 57; wall of, as distinguished from wall of ovarian cyst, 22; inner lining is endothelial, 48; sometimes developed close to ovarian fimbria

BÖH

of tube, 48, 52; papillary growths in, indicate true parovarian origin, 55 (see *Papillomatous cysts*, *Parovarium*, and *Sessile cysts*); rupture of, 56, 57, 108; cicatrix in ruptured wall of, 108; inflammation of wall of, 56; adhesions, 56; tapping, cure of, by, not advisable, 55; operation, results very favourable, 54, 57; clinical aspects of, 53; flattening of ovary by growth of, 55

Böhn, on inflammation of urethral ducts, 43

Bone in dermoid cysts, 86

Bone, necrosis of, after ovariectomy, 129, 163

CANCER of ovary, colloid, 20, 21, 104; hard or scirrhus, 103

Cells, proliferating and vacuolated in ovarian and ascitic fluid, 16

Childhood, ovarian cysts and ovariectomy in, 79, *note*

Chondrification, in glandular or adenomatous growths, 31; in a papillomatous growth within the Fallopian tube, 173; in septa of loculi in cysts, 29

Cicatrix, of abdominal incision, hernia of, causes of and cases, 128; of cyst wall, 108

Coblentz (Dr. H.), on Gartner's and the urethral ducts, 43, 74; on burrowing of ovarian cysts under the peritoneum, 73

Colloid, cancer of ovary, 20, 21; changes in ovarian tissues, 5; cysts, rupture of, 109; in relation to epithelial changes, 33, 34; in cysts, 15, 109; rupture of cysts with colloid contents, 109

Compression forceps, their value in treatment of abdominal wound, 130

Crepitus on palpation, 37, 133

DER

Cruveilhier, on distension and obstruction of the Fallopian tubes, 174

Cyst. (See *Broad ligament cyst*, *Dermoid cyst*, *Exogenous cyst*, *Fused double ovarian cysts*, *Multilocular ovarian cyst*, *Rupture of ovarian cysts*, *Secondary cysts*, &c.)

Cystoid degeneration of broad ligament, 48

DEFÆCATION, contents of ovarian cyst discharged during, 113; sloughing pedicle discharged during, 151

Dermoid cyst, age of patients with, 79; bone in, 86; cartilage in, 85, 88; cases of double, 81, 121; case of, in an infant, operation, 79, *note*; case of, complicated by malignant disease of stomach, rectum, and omentum, 81; cases of, with multilocular cyst of opposite ovary, 84; cases of, mixed with glandular or simple multilocular cystic structure, 84; case of, in patient aged sixty-three, 79, 83; epidermic structures in, 87; fat in, 80, 88; glandular and cystic structures in, 88; hair in, 79; incipient, 77, 82; muscle, nerve, and lymphoid tissue in, 88; pigmentation of umbilicus in case of, 81; pill-like bodies in, 80; plugging of vessels of pedicle in, 84; pregnancy in case of, 85; rupture of, into bladder, 86, 113; rupture of, into peritoneal cavity, 85, 107; sessile, 68, 75, 83; statistics of, 79; sarcomatous growths in, 89; teeth and bone in, 79, 86; theories on origin of, 77; twisting of pedicle of, 81, 89 (see *Twisting of Pedicle*); unilocular or almost unilocular as a rule, 83; variations in fluid

DES

- and solid contents, 80; wall of, distinguished from multilocular cyst, 22
- De Sinéty and Malassez, on origin of ovarian cysts, 5, 12; on vegetations on outer surface of cysts, 23
- Diagnosis, observations on, in cases of ovarian tumour, 35
- Double ovarian cysts, 20; fusion of, 17. (See *Fused double ovarian cysts*)
- Drainage, after incision of cysts, a bad substitute for ovariectomy, 130

ENDOTHELIUM, on outer wall of multilocular cysts, 25; within tense cysts, 26; in thin-walled cysts found within glandular growths, 30

Epithelium, change of character of, in development of multilocular glandular cysts, 34; of glandular intracystic growths, 33; of inner wall of multilocular cysts, 26, 27; of outer wall, 25

Eve (Mr. F. S.), on changes in intracystic epithelium from pressure, 26; on incipient cystic disease of the ovary, 14, 35

Exogenous cyst, 16; false variety of, caused by rupture of main wall, exposing secondary cysts, 16

Exploratory operations, not dangerous when performed in cases of suspected solid ovarian tumours, 94; statistics of, 94

Extra-uterine pregnancy, case of tubal type, diagnosed as ovarian tumour, 168

FALLOPIAN tube, dilated, case of, 169; position of dilated, in relation to ovary, 167; hyper-

GAN

trophy of, 168; *morsus diaboli* of, meaning and origin of the term, 165; obstruction of, in ovarian disease, 169; ovarian fimbria of, cysts developed in broad ligament close to, 52; its true position during life, 167; its relation to free papillomatous outgrowths, 175; its secondary fringes often found on surface of multilocular cyst, 24; papilloma of, remarkable case of, 170; papillomata on mucous membrane of, 175; position of, during life, 165; stretching of, in cystic disease of broad ligament, 168

Fallopian tube cysts, 52. (See *Morgagni, Hydatid of*)

Fibroid tumours of ovary, generally sarcomatous or myomatous, 96

Fischel, on the epithelium of the parovarium, 51

Fluid, ovarian, chemical characters of, Dr. Ralfe on, 15; in dermoid cysts, 80; in multilocular cysts, 15; in papillomatous cysts, 49, 60; not highly irritant to peritoneum, 105; passed by the rectum, 113; vacuolated cells in, 16

Fœtus, papillomatous cysts in, 62

Follicles. (See *Graafian Follicles*)

Forceps, compression, their value in treatment of abdominal wound, 130

Foulis, on 'Pflüger's tubes,' 3; on proliferating vacuolated cells in ovarian fluid, 16

Fowler (Dr. J. K.), on hydro- and pyosalpinx, 170

GABBETT (Dr. H. S.), on colloid changes in the ovary, 9

Gangrene of cyst, followed by rupture, 109; a result of twisting of the pedicle, 120

GAR

- Gartner, duct of, 42; papilloma of, 74; relation to urethral duct disputed, 43
- Glandular or adenomatous growths in ovarian cysts, 20, 21; chondrification in, 31; cysts containing, may be sessile, 68, 75; cysts, thin-walled, in substance of, 30; epithelium of, 33; microscopic appearances of, 31; papillary form not identical with papillomatous growths, 31; rupture of main cyst wall by, 24; sarcomatous characters in, 21; statistics of, 29
- Goodhart (Dr. J. F.), on kidney disease in cases of abdominal tumour, 153
- Graafian follicles, atrophy of, 6; Beigel and Patenko on atrophy of, 6, 7; dropsy of, 8; number at birth, 5. (See *Origin of multilocular ovarian cysts*)
- Gut, silkworm, 127

HÆMORRHAGE, into ovary, in relation to the origin of sarcoma, 96; after rupture of cyst, 110; in cases of twisted pedicle, 121; into sarcoma of ovary, 100

Harris (Dr. Vincent D.), and author, on origin of multilocular ovarian cysts, 7, 11

Hegar, his case of sloughing pedicle passed by the rectum, 151

Hennig, on new growths of the Fallopian tube, 174

Hernia, of cicatrix of abdominal wound, 128; cause of, *id.*; removal of distended cicatrix, *id.*; umbilical, attempted radical cure of, in course of an ovariectomy, 129

Hilum cysts, 59; cases of, 67, 69; may be pedunculated, cases, 68, 71; sessile, as a rule, 60. (See *Papillomatous cysts*)

LIG

His, on the position of the Fallopian tubes, 166

Hydatid of Morgagni. (See *Morgagni, hydatid of*)

Hydrosalpinx, 169

Hypertrophy of Fallopian tube, 168

Hypertrophy of ovarian stroma, its histological resemblance to sarcoma of ovary, 98

Hyrzl (Professor Josef), on the term *morsus diaboli*, 165

INCISION of cyst, followed by drainage, two cases demonstrating its futility, 130

Incomplete operations, not specially dangerous when a malignant ovarian tumour is discovered, 94

Infancy, ovarian cysts and ovariectomy in, 79, *note*. See also *Fœtus*

Infundibulo-pelvic ligament, its influence on the position of the ovary, 167

JAW-BONE, necrosis of, after ovariectomy, 129, 163

KEITH (Dr. T.), on the tapping of simple broad ligament cysts, 55

Kidney, cases of diseased, found after death from ovarian disease, ovariectomy, or hysterectomy, 155; relation of disease of, to ovariectomy and its results, 152

Klein, on tissues found in the healthy ovary, 95

Kleinwächter, on the urethral ducts, 43

Kocks, on the urethral ducts, 43

LIGAMENT of the ovary. (See *Ovarian ligament*)

LIG

Ligature of pedicle, complete intraperitoneal, significance of the term, 137; advantages of, as regards abdominal wound, 128; advantages of, over clamp, as regards after-results, 150; cases of unfavourable changes in the pedicle after, 143; clot on stump of pedicle after, 151; conservative changes in ligatured pedicle after, 140; history of its introduction, 138; material used for, changes in, 142; museum specimens illustrating changes after, 140; Smith, Dr. Nathan, first to employ, 138; sloughing not produced by, 139; tightening of the ligatures in, different opinions of Wells, Thornton, and author concerning, 151; varix or hæmatocele following, 148; Wells, Sir T. Spencer on, 139, 151

Linea alba, how to divide it accurately, 127

Lung, abscess in, after ovariectomy, 129

MALASSEZ. See *De Sinéty and Malassez*

Maxillary bone, inferior, necrosis of, after ovariectomy, 129, 163

Melanosis, simulated by hæmorrhage into sarcomatous ovarian growth, 100

Meredith, on cysts burrowing under the peritoneum, 73; on rupture of cysts, 117

Morgagni, hydatid of, 45; calcareous degeneration of, 121; development of, from Müller's duct, 53; hypertrophy of, 53, 131; its significance, 45

Morsus diaboli, erroneous theory concerning, 165; true meaning and derivation of term, 166

Müller, duct of, 52. (See *Morgagni, hydatid of*)

OPE

Multilocular ovarian cyst, appearance of its outer wall; distinction from other tumours, 14, 22; contents, fluid, 15; epithelium of outer wall of, 25; exogenous type (see *Exogenous cysts*); fusion of, of both ovaries into one tumour (see *Fused double ovarian cysts*); glandular growths in (see *Glandular growths in ovarian cysts*); middle coat of main wall of, 25; inner coat, 26; origin of (see *Origin of multilocular ovarian cysts*); rupture of septa of, 28; secondary cysts in (see *Secondary cysts*); septa within, 27; sessile or non-pedunculated, 68, 73; statistics of author's experience of, 20

Myoma of ovary, 96; often taken for fibroma, 96

NECROSIS of jaw after ovariectomy, 129, 163

Nephritis in ovarian disease, 155

Nerve tissues in dermoid cysts, 88

New growths in ovary (see *Cancer of ovary, Glandular growths in ovarian cysts and Sarcoma of ovary*)

Noeggerath, on origin of cystic disease of ovary from diseased blood-vessels, 12

Non-pedunculated cysts (see *Sessile cystic tumours*)

OLIGOCYSTIC, objection to the term, 27

Omentum, adherent, supplying cyst with blood in case of twisted pedicle, 122; cancer of, 81; colloid material, effect of, upon, 109

Operations, incomplete and ex-

ORI

- ploratory (see *Exploratory operations*)
- Origin of multilocular cysts, atrophy of follicles in relation to, 7; colloid changes in relation to, 5; changes in vessels, in relation to, 12; De Sinéty and Malassez on, 1, 13; Eve on, 13; Pfüger's tubes in relation to (see *Pfüger's tubes*)
- Ovarian fimbria of Fallopian tube, cysts developed in broad ligament, close to, 52; position of, during lifetime, 167; papillomatous outgrowths, its relation to, 175
- Ovarian ligament, an essential part of a true pedicle, 69; its relation to myoma of uterus and ovary, 96
- Ovariectomy in infancy, 79, *note*

PAPILLARY growths in glandular tumours, their distinction from true papillomata, 31

- Papilloma of Fallopian tube, cases of, 170, 175
- Papillomatous cysts, cases of, developed in hilum of ovary, 67; case of, independent of ovary, 74; development of, from hilum of ovary, 59; from parovarium, 49; diagnosis of origin of (from hilum or parovarium), often difficult, 65; fetus, case of, in, 62; sessile as a rule, 59; may be pedunculated when arising from hilum, 68, 71 (see *Broad ligament cyst, simple*, *Hilum cysts*, and *Parovarium*)
- Papillomatous growths, characters and microscopic appearances of, 65; development of, from parovarium, 49; free or uncysted variety of, infesting broad ligament, surface of ovary, &c., 66, 175; rupture of cysts containing, 111

PER

- Paracentesis, in relation to adhesions, 38
- Parovarian cyst, true, really papillomatous, 49; may be developed from terminal part of horizontal duct of parovarium, 49 (see *Broad ligament cyst, simple*)
- Parovarium, 40
- Efferent duct of (duct of Gartner), 42; its epithelium not always ciliated, 51; papilloma of, 74; relation to urethral duct disputed, 43
 - Horizontal tube or canal of, 42; terminal cyst of, 46; resemblance of terminal cyst of, to simple broad ligament cyst, 49
 - Vertical tubes of, 42; cysts developed from, 46; tendency of cysts developed from, to become the seat of papillomatous growths, 49, 51; number of, 44; obliteration of most internal constant, 44; cases of papilloma of broad ligament probably developed from, 74
- Patenko, on atrophy of Graafian follicles, 7
- Paucilocular, objection to term, 27
- Pedicle, absence of (see *Sessile cysts*); double, in fused double ovarian cysts, 17; in hilum cysts bearing papillomatous contents, 68, 71; true and false, distinction between, 69; vein in, dilatation of, 125 (see also *Ligature of pedicle* and *Twisting of pedicle*)
- Pelvic examination, 38
- Pericarditis, purulent, after ovariectomy, 129
- Periostitis of jaw after ovariectomy, 129
- Peritonitis, absence of clinical symptoms of, in case of, 109; effects of, as seen during operation, 110; after rupture of cyst, 108 (see also cases *passim*)

FIG

- Pigmentation of umbilicus, in case of dermoid cyst, 81
 Pill-like bodies in dermoid cyst, 80
 Pflüger's tubes, their existence doubted, 2; author's observations on, 3, 4; Balfour on, 2; De Sinéty and Malassez theory on origin of multilocular cysts based on belief in existence of, 5; Foulis on, 2
 Pleurisy after rupture of cyst, 108; in case of papilloma of Fallopian tube, 170
 Pregnancy, co-existent with cystic myoma of uterus, 94; diagnosis from solid ovarian tumour, 93; tubal, 168
 Proliferating and vacuolated cells, in ovarian and ascitic fluid, 16, 171
 Psammomatous changes in papillomatous cysts, 65
 Pyelitis in ovarian disease (see Cases), 155-160
 Pyo-pericarditis after ovariectomy, 129
 Pyosalpinx, 169

- R**ALFE (Dr. C. H.), on chemical characteristics of ovarian fluid, 16
 Rectum, ovarian fluid passed by, 113; sloughing pedicle passed by, 151
 Rectus abdominis muscle, dangers of wounding, in making abdominal incision, 127, 128
 Rieder, on the urethral ducts, 43
 Ritchie (Dr. C. G.), on cysts receiving their blood-supply from adhesions, 123; his labours in ovarian pathology, 32
 Rokitansky on new growths within the Fallopian tube, 174
 Round-celled sarcoma of ovary, 99; in cystic disease, 21
 Rupture of ovarian cysts, 16, 105;

SES

- bad results after, when colloid material is effused, 109; blocking of, by secondary cyst, or papillomatous growth, 85, 114; changes in cyst wall, causing, 114; danger of, when cyst contains papillomatous growths, 111; general considerations on, 105, 114; hæmorrhage following, 110; histories of, 107; immediate results of, 108; nature and appearances of, 114; statistics of, 106; traumatic, generally a long rent, 114
 Rupture into bladder, 113; in posterior part of cyst, 110; of dermoid cyst, 107, 113; into rectum, 113; of septa and secondary cysts, 28, 116; of simple broad ligament cysts, 56, 57, 108

- S**ARCOMA of ovary, alveolar, 100; hæmorrhage into, 100; melanosis simulated by hæmorrhage into, 100; mixed, 100; round-celled, 99; spindle-celled, its histological resemblance to simple hypertrophy of ovarian stroma, 98
 Schüller (Dr. Max), on the urethral ducts, 43
 Scirrhus of ovary, 103
 Scybala, impede pelvic examination, 38
 Secondary cysts, may fill up rupture in wall of main cyst, 16, 114; in relation to predominating or largest cavity within main wall of tumour, 27; relation to septa within ovarian tumours, 29; in substance of main cyst wall, 26; thin-walled type, in glandular growths, 30
 Septa, in multilocular cysts, 27
 Sessile cystic tumours, dermoid, 68, 75; cases of, of multilocular and glandular type, 68, 73, 75; hilum cysts generally of this

SIG

- class, 60; operations on, difficulty of, 68
- Sigmoid flexure, adhesion of, to cyst, 19
- Silkworm gut, its value as a material for suture of abdominal wound, 127
- Skene's tubes, 43
- Solid tumours of the ovary, normal ovarian structures in relation to, 95 (see *Cancer of ovary*, *Myoma*, *Sarcoma*)
- Spindle-celled sarcoma of ovary, 98
- Supra-renal body, cyst of, 136
- Sutures, of abdominal wound, material for, 127; bad results after drawing them too tightly, 128
- Symmetrical ovarian cystic disease (see *Double ovarian cysts* and *Fused double ovarian cysts*)

- TAIT** (Mr. Lawson), on the earlier ovariectomies, 54; on twisting or axial rotation of the pedicle, 118; on hydro- and pyosalpinx, 169
- Tapping, in relation to adhesions, 38
- Teeth in dermoid cysts, 79, 86
- Teratoma, the term objectionable, 92
- Tetanus after ovariectomy, 120, 141
- Thornton (Mr. J. Knowsley), on recurrent dermoid tumours, 89; on tightening of ligature of ovarian pedicle, 151; on bad results of drawing the abdominal sutures too tightly, 128; on proliferating cells in ovarian fluid, 16, 171 (see also clinical reports, *passim*)
- Thrombosis of femoral vein after ovariectomy, 70
- Tubal gestation, case of, simulat-

UTE

- ing ovarian tumour, death after manipulation, 169. Relation of foetal sac to ovary in, 167
- Tubo-ovarian cyst, specimen of, 168
- Tumours of Ovary (see *Cancer of ovary*, *Dermoid cyst*, *Glandular growths in ovarian cysts*, *Multilocular ovarian cyst*, *Sarcoma of ovary*, &c.)
- Twisting of pedicle, cases of, 121; cyst completely separated from its normal attachment, in case of, 122; dermoid cysts, cases of this complication in, 81, 121; dilatation of vein in pedicle in case of, 125; gangrene of cyst following, 120; hæmorrhage into cavity of cyst causing anæmia, in case of, 121; opinion of Wells, Tait, and author on cause of, 118; symptoms of, in chronic cases, 120; tetanus after operation in case of, 120; vascular supply of cyst maintained through adhesions, in cases of, 123
- ULCERATION** of cyst wall, in relation to rupture of cysts, 115
- Umbilical hernia, radical cure of, attempted in course of an ovariectomy, 129
- Umbilicus, pigmentation of, in case of dermoid cyst, 81
- Unilocular cyst, often a mere variety of the multilocular form, 20, 27
- Urethral ducts, 43; alleged relation of, to duct of Gartner, 43; catarrh of, 44; said to be ducts of a special urethral gland, 44
- Urine, in cases of ovarian tumour, 152
- Uterine cyst, outer wall of, distinguished from that of an ovarian cyst, 22

UTE

Uterine myoma and myoma of ovary, 96

Utero-ovarian ligament (see *Ovarian ligament*)

VACUOLATED cells, in ovarian and ascitic fluid, 16, 171

Vein, dilated, in a twisted pedicle, 125; plugging of femoral, after ovariectomy, 70

Vermiform appendix, adherent to ovarian cyst, 19, 132; detached cyst adherent to, 135, 136

WALDEYER, on epithelial lining of the parovarium, 51; his estimate of the number of ova in the human ovary at

ZON

birth, 5; Foulis on his 'tubes,' 3 (see also *Pföger's tubes*)

Wells (Sir T. Spencer), on length of abdominal wound, 126; on degeneration of the cyst wall, 114; on ligature of the pedicle, 139, 151; his experience of sarcoma of ovary, 95; on the urine in ovarian disease, 152, 161; on the stretching of adhesions, 37; on twisting of the pedicle, 118; (see also clinical reports, *passim*)

Wound, abdominal (see *Abdominal wound*)

ZONA vasculosa, or tissue of the hilum of the ovary (see *Hilum cysts* and *Papillomatous cysts*)

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